UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/AC.105/675
12 May 1997

ORIGINAL: ENGLISH

COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

COORDINATION OF OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM: PROGRAMME OF WORK FOR 1997 AND 1998 AND FUTURE YEARS

Report of the Secretary-General

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EXPLANATORY NOTES

Secretariat units, bodies and specialized agencies

ECE	Economic Commission for Europe
ESCAP	Economic and Social Commission for Asia and the Pacific
ECA	Economic Commission for Africa
ESCWA	Economic and Social Commission for Western Asia
UNEP	United Nations Environment Programme
UNDCP	United Nations International Drug Control Programme
UNDP	United Nations Development Programme
UNHCR	Office of the United Nations High Commissioner for Refugees
UNITAR	United Nations Institute for Training and Research
WFP	World Food Programme
FAO	Food and Agriculture Organization of the United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
ICAO	International Civil Aviation Organization
WHO	World Health Organization
ITU	International Telecommunication Union
WMO	World Meteorological Organization
IMO	International Maritime Organization
WIPO	World Intellectual Property Organization
IFAD	International Fund for Agricultural Development
IAEA	International Atomic Energy Agency

Other acronyms and abbreviations

ACSYS	Arctic Climate System Study (WCRP)
ADEOS	Advanced Earth Observing Satellite
AEPS	Arctic Environment Protection Strategy
AFRICOVER	Digital Land Cover Database for Africa
AGRHYMET	Agrometeorology and Operational Hydrology and Their Applications
AISI	African Information Society Initiative
ARTEMIS	Africa Real-Time Environmental Monitoring Information Systems
AVHRR	Advanced Very High Resolution Radiometer
BDT	Telecommunications Development Bureau (ITU)
CEOS	Committee on Earth Observation Satellites
CGIAR	Consultive Group on International Agricultural Research
CIAT	Centro Internacional para la Agricultura Tropical
CNES	Centre national d'études spatiales (France)
CNS/ATM	communications, navigation and surveillance and air traffic management
COPINE	cooperative information network linking scientists, educators and professionals in Africa
COSPAR	Committee on Space Research
COSPAS-SARSAT	International Search and Rescue Satellite System
CPM	Conference Preparatory Meeting
CRTEAN	Centre régional de télédétection des Etats de l'Afrique du Nord
DANIDA	Danish International Development Agency
DCP	data collection platform

DEIA	Division of Environmental Information and Assessment (UNEP)
DSE	German Foundation for International Development
EDC	Earth Resource Observation System Data Center (USGS)
EIS	environmental information system
ENRIN	Environmental and Natural Resource Information Networks (UNEP)
EPA	Environmental Protection Agency (United States of America)
EPIRB	emergency position-indicating radiobeacon
ERS	European remote sensing satellite
ESA	European Space Agency
ESINAP	Earth Space Information Network for Asia and the Pacific
ESRIN	European Space Research Institute
FINNIDA	Finnish International Development Agency
FRA	Forest Resources Assessment (FAO)
GARS	Geological Applications of Remote Sensing
GAW	Global Atmosphere Watch (WMO)
GCOS	Global Climate Observing System (UNEP/IOC/WMO/ICSU)
GEF	Global Environment Facility
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GIEWS	Global Information and Early Warning System (FAO)
GIS	geographic information systems
GLONASS	Global Navigation Satellite System (Russian Federation)
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GOOS	Global Ocean Observing System (UNEP/IOC/WMO/ISCU)
GPS	Global Positioning System
GRID	Global Resource Information Database (UNEP)
GTOS	Global Terrestrial Observing System (UNEP/FAO/UNESCO/WMO/ICSU)
ICIMOD	International Centre for Integrated Mountain Development
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
ICRP	International Commission on Radiological Protection
ICSU	International Council of Scientific Unions
IDNDR	International Decade for Natural Disaster Reduction
IGAD	Intergovernmental Authority on Development
IGN-FI	Institut géographique national - France international
INFOCLIMA	World Climate Data Information Referral System (WMO)
INFOTERRA	International Environmental Information Exchange and Referral System (UNEP)
Inmarsat	International Mobile Satellite Organization
INPA	National Institute for Research in the Amazon (Brazil)
INTELSAT	International Telecommunication Satellite Organization
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IRRI	International Rice Research Institute
ITC	International Institute for Aerospace Survey and Earth Sciences
IUCN	International Union for the Conservation of Nature
LANDSAT	Land Remote Sensing Satellite
LIS	land information system
MAB	Man and Biosphere (UNESCO)
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration (United States of America)
NASDA	National Space Development Agency (Japan)
NLR	National Aerospace Laboratory (Netherlands)

NOAA	National Oceanic and Atmospheric Administration (United States of America)
NORAD	Norwegian Agency for Development Cooperation
OECD	Organisation for Economic Co-operation and Development
ORSTOM	Institut français de recherche scientifique pour le développement et coopération
OSS	Observatoire du Sahara et du Sahel
PAC	Programme Activity Centre (UNEP)
PAHO	Pan American Health Organization
RAMSES	Reconnaissance and Management System of the Environment of Schistocerca
RAPIDE	African Network for Integration and Development
RASCOM	Regional African Satellite Communications System
RCSSMRS	Regional Centre for Services in Surveying, Mapping and Remote Sensing (ECA)
RECTAS	Regional Centre for Training in Aerospace Surveys (ECA)
RESPAS	Remote Sensing Processing and Archiving System for Forest Assessment and Monitoring (FAO)
SADC	Southern African Development Community
SAR	synthetic aperture radar
SARPs	Standards and Recommended Practices
SITA	International Society of Aeronautical Telecommunications
SOLAS	International Convention for the Safety of Life at Sea
SOTER	Soils and Terrain Digital Database (UNEP/FAO/International Soil Reference and Information Center/ International Society of Soil Sciences)
SPACECOM	Space Communications Technology Applications (ITU)
TELECOM	World Telecommunication Exhibition and Forum (ITU)
TREDMAR	Training and Education in Marine Science
TREES	Tropical Ecosystem Environment Observations by Satellite
TSB	Telecommunication Standardization Bureau (ITU)
USAID	United States Agency for International Development
USGS	United States Geological Survey
WAFS	World Area Forecast System
WCMC	World Conservation Monitoring Centre
WCRP	World Climate Research Programme (WMO/ICSU/IOC)
WHYCOS	World Hydrological Cycle Observing System (WMO/World Bank)
WOCE	World Ocean Circulation Experiment (WCRP)
WRC	World Radiocommunication Conference (ITU)
WTDC	World Telecommunication Development Conference
WTPF	World Telecommunication Policy Forum (ITU)
WTSC	World Telecommunication Standardization Conference
WWF	World Wildlife Fund

INTRODUCTION

1. The present report has been prepared by the Secretary-General at the request of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space and concerns efforts at coordinating the activities of organizations within the United Nations system that relate to assistance to developing countries in the practical applications of space technology.

2. The report is based on the contributions submitted by the organizations concerned in response to the United Nations request for information on concrete programmes of work envisaged primarily for 1997 and 1998 and was finalized at the Inter-Agency Meeting on Outer Space Activities, to be held at Vienna from 28 to 30 May 1997.

3. The report consists of three sections. Section I contains a list of the participants in outer space activities within the United Nations system; a matrix of outer space programmes is also provided to identify the activities of each participant in specific fields. Section II presents a summary of major activities and programmes planned for 1997 and 1998 and future years by the organizations within the United Nations system as a whole. Section III presents concrete activities or programmes planned by individual organizations in an integrated form under subsections on remote sensing and the geographic information systems (GIS), communications and navigation, meteorology and hydrology, basic space science, safety aspects and other activities in the field of space science and technology and its applications.

4. There are three headings - education and training programmes, expert services and survey missions, and dissemination or exchange of information - under each of the first three subsections in section III (remote sensing and GIS, communications and navigation, and meteorology and hydrology). Concerning the last of those headings, more efforts are being made within the United Nations system to develop databases to disseminate information with increased accuracy, quantity and speed. In the present report, activities related to the establishment or development of databases are categorized as studies on or implementation of pilot projects while those related to the operation of databases, after the development phase is completed, are categorized as dissemination or exchange of information.

5. Valuable information on space technology or on operational systems can also be disseminated at meetings or conferences where decision makers in space activities exchange their opinions and may elaborate strategies or plans for future activities. Since the main purpose of such meetings or conferences is not to educate or train, they are also categorized as dissemination or exchange of information, rather than education and training programmes.

6. Under the subsection on remote sensing and GIS, there is one more heading, "Capacity building", reflecting the increase in efforts to develop indigenous capability in space science and technology in developing countries.

7. Under the subsection on activities in the field of communications and navigation, there are two additional headings relating to the efforts in the United Nations system concerning legal aspects. One concerns the regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services. The other heading concerns the efforts towards the establishment of new legal frameworks or the development of new technological systems to complement the existing legal frameworks.

I. PARTICIPANTS IN OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM AND MATRIX OF OUTER SPACE PROGRAMMES

8. The participants in outer space activities within the United Nations system included the following Secretariat units, bodies, research institutes, specialized agencies and other organizations: Office for Outer Space Affairs, Department for Development Support and Management Services, International Decade for Natural Disaster Reduction (IDNDR) secretariat, Economic Commission for Europe (ECE), Economic and Social Commission for Asia and the Pacific (ESCAP), Economic Commission for Africa (ECA), United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO), International Civil Aviation Organization (ICAO), World Health Organization (WHO), World Bank, International Telecommunication Union (ITU), World Meteorological Organization (WMO), International Maritime Organization (IMO), World Intellectual Property Organization (WIPO) and International Atomic Energy Agency (IAEA).

9. A matrix of outer space programmes within the United Nations system is presented below.

II. SUMMARY OF MAJOR ACTIVITIES AND PROGRAMMES PLANNED FOR 1997 AND 1998 AND FUTURE YEARS

10. Organizations within the United Nations system have planned activities for 1997 and 1998 and future years within the fields of remote sensing and GIS, communications and navigation, meteorology and hydrology. Valuable space-related or space-aided activities in basic space sciences, improvement of safety and other activities related to space science and technology and its applications will also be conducted by organizations within the United Nations system.

11. The planned activities range from education and training to operational applications of technologies. Three categories of activities are notable in most of the above-mentioned fields of space activities. The first category to be noted is the education and training programmes, which are generally offered by holding training courses, workshops and seminars or supporting fellowships. Efforts are being made to improve the educational and training environment by establishing new facilities or providing educational tools.

12. Secondly, organizations within the United Nations system provide expert services and conduct survey missions to identify specific areas of applications relevant to a given country or group of countries. Specific studies on pilot projects in a country or group of countries are also being conducted. In recent years, there has been increasing emphasis on maximizing the benefits from space activities for social and economic development through operational applications of existing space technologies. A number of projects with such emphasis are carried out at the local, regional or global level.

13. Thirdly, dissemination of information on the status of technology or on the operational systems has always been an important element in space activities. Organizations within the United Nations system issue numerous recurrent or non-recurrent publications on emerging new space technologies. The publications also contain suggestions on possible applications of those technologies. More information is being distributed through computer networks, which in turn stimulates demand for the further development of databases. The use of Internet and its various services, including electronic mail, File Transfer Protocol, name lists and the World Wide Web, is considered a very appropriate means of improving coordination among the organizations of the United Nations system, and efforts are being made to further expand the use of Internet for such purposes.

Participants in outer space activities and matrix of outer space programmes[a]

United Nations entity	*Remote sensing*	*Communications and navigation*	*Meteorology and hydrology*	*Basic space science*	*Safety aspects and natural disaster reduction*	*Other activities*
OOSA[b]	29,36,41	147,153,155,160, 161		237, 238		248,250-255, 261
DDSMS[c]	41					
DHA/IDNDR secretariat[d]	60				239	
UNDCP	57,58,95					
UNEP	59-75,93,106, 112-117,129-138	162,163,172,173	199,200,204-206, 209,211,215, 222-224, 233,234			
ECA	42,76-79,99,118,124-125,139	148,156,157,164, 174,185				249
ECE	80,126,137					
ESCAP	30,31,37,39,43,81, 119-121,127,136, 140-142	149,165,175,177	194,225,235,236			256-258
ESCWA	82,83					
UNDP	42,62,129,132,133, 135-137		198,212			
UNITAR	129,137					
FAO	31,32,38, 44-55,58,69,78, 84-104,122,129,133, 143-146		201-205, 207,209,210,234		245	
UNESCO	33-35,40,56,71,93, 105-111,123,128	158, 166-168,184,185	195,197,204,205, 208-211,214,215, 222,223,226,227, 229,230,233,234			
UNIDO						262
ICAO		150,186,187, 190-193	232			
WHO	137				245	
ITU		151,152,154,159, 167,169-171,176, 178-183,185,188			240-242,244	
WMO	129		196,198,204,205,209, 212-223,228-234			
IMO		189,190,193			240,242-244	
WIPO						259
World Bank	44,137		212,221			
IAEA					245-247	

[a]The numbers in each column indicate the relevant paragraphs in the present report.
[b]Office for Outer Space Affairs of the Secretariat.
[c]Department for Development Support and Management Services of the Secretariat.
[d]Department of Humanitarian Affairs of the Secretariat/International Decade for Natural Disaster Reduction secretariat.

14. In the field of remote sensing, the United Nations and its specialized agencies have planned a number of international, regional and national training courses and workshops. They cover remote sensing applications in general as well as specialized topics such as sustainable development of natural resources and energy, natural resources and environment management, land-cover mapping and land-use planning. Most of these international and regional training courses are jointly organized by two or more organizations within the United Nations system, often in cooperation with other international organizations and/or Governments.

15. Many of the organizations of the United Nations system offer expert services in their respective areas of competence and carry out pilot projects with the use of remote sensing technologies and GIS. These technologies are applied to a wide range of activities, such as environment monitoring, management and development, monitoring of natural resources and natural disasters, early warning for food security, land-cover mapping and land management, forest planning and management, mapping of desertification, monitoring of cultural sites and pest disease control. A number of projects by the organizations of the United Nations system are aimed at establishing databases or information networks at the regional or global level, such as the Digital Land Cover Database for Africa (AFRICOVER), Africa Real-Time Environmental Monitoring Information Systems (ARTEMIS), Geological Applications of Remote Sensing (GARS) programme and Global Resource Information Database (GRID) projects, to name a few.

16. In the area of dissemination of information, organizations either provide information upon request or issue recurrent or non-recurrent publications concerning technological status or existing operational systems to increase awareness of the useful applications of remote sensing technologies. Reflecting the rapid expansion of the information superhighway with the use of computer networks, an increasing number of organizations are establishing databases that will tremendously increase the availability of data of interest for a larger number of users. It should be noted that meetings of experts or decision makers and workshops organized within the United Nations system also provide opportunities to exchange updated technological or policy-related information that is vital in elaborating regional or global strategies for social and economic development with the use of remote sensing technologies.

17. There will be a number of activities within the United Nations system with the particular objective of capacity building in developing countries in the use of remote sensing and GIS technologies. Most of the efforts will be directed towards the strengthening of operational capability of existing regional or national institutions involved in environmental management for sustainable development, natural resource monitoring or land-cover mapping. Especially within the framework of field projects, the development of human resources is considered an important factor.

18. In the field of communications and navigation, the United Nations system will organize a training course and several workshops and provide fellowship support for in-depth training. As far as expert and technical advisory services are concerned, organizations within the United Nations system participate in the development of domestic or regional satellite communication systems for various purposes such as improving distance education, increasing public awareness in environmental protection and supplementing early warning systems for food security. Satellite communication systems are also considered a vital tool for social and economic development, as demonstrated by the Regional African Satellite Communications System (RASCOM) project. Satellite communication systems are also used to improve communications between the headquarters and the regional offices of the organizations or among their regional offices, as demonstrated by the Mercure satellite telecommunications system.

19. The results or interim reports of the projects or studies on the use of satellite technology conducted within the United Nations system are also available in the form of recurrent or non-recurrent publications or disseminated in electronic form through computer networks.

20. In view of the rapid increase in the use of frequency bands for various services, efforts are being made to update the international radio regulatory process and to prepare for future requirements. The review of the spectrum/orbit resources allocation procedure is also under way with a view to increasing efficiency and equity in spectrum/orbit utilization.

21. The work of the specialized agencies of the United Nations is also making significant contributions in the area of applications of space technology for land, maritime and aeronautical mobile communications. Studies on a worldwide radio-navigation system are being conducted within the United Nations system. As the operational availability of the Global Positioning System (GPS) and the Global Navigation Satellite System (GLONASS) is limited, consideration is being given to a post-GPS/GLONASS system.

22. The application of satellite technology constitutes an important element of technical cooperation activities in operational meteorology and hydrology. Several training programmes are planned for 1997 and 1998 to discuss various subjects such as satellite meteorology, tropical meteorology and marine studies.

23. Through the provision of expert services, efforts are made to develop a marine and coastal zone data information system, to improve management of water and coastal resources, to upgrade meteorological observations by installing networks of data collection platforms (DCPs) and to improve the meteorological telecommunication system by planning the implementation of a regional meteorological telecommunication network in various regions. Reflecting the increasing awareness of global changes, including climate change, organizations within the United Nations system also cooperate in global schemes, such as the Global Climate Observing System (GCOS), Global Terrestrial Observing System (GTOS), Global Ocean Observing System (GOOS), Global Atmosphere Watch (GAW), World Climate Research Programme (WCRP) and World Climate Data and Monitoring Programme. A series of technical reports on climate research and ocean observations, as well as water-resource management, is also published.

24. In basic space sciences, workshops are being planned in the region of Latin America and the Caribbean for 1997, including the one to be organized jointly in cooperation with the Committee on Space Research (COSPAR) to support space research activities of scientists from developing countries.

25. Organizations within the United Nations system also make efforts towards the improvement of safety in various human activities. While studies are under way to apply space technology to establish safety and early warning systems, such as the Global Maritime Distress and Safety System (GMDSS) and early warning systems for the reduction of natural disasters, consideration is given also to emerging risk and danger as a result of expanding space activities, such as the risk of the use of nuclear power sources in outer space. Space technology can be a solution for safety in many aspects. Conversely, space activities may create a risk which should be dealt with by various organizations.

26. Further progress has been made towards the establishment of United Nations-affiliated regional centres for space science and technology education in cooperation with the Secretariat, regional commissions and other interested organizations within the United Nations system. The Centre for Space Science and Technology Education in Asia and the Pacific became operational in November 1995 and will be followed by centres in Latin America and the Caribbean and in Africa, to be established by the end of 1997.

27. As the United Nations prepares its strategy for the coming millennium, it has become clear that one of its principal functions is to promote sustainable development on a global scale through coordinated actions within the United Nations system as a whole. While the United Nations system, with various organizations with specialized knowledge and expertise and with influence on the international community, has high potential to contribute to global prosperity, maximum efforts should be made for the optimum use of available resources by coordinating the activities of those organizations. Such efforts for the enhancement of coordination should

not be seen as an attempt to intensify a zero-sum competition among the organizations in the distribution of resources. The rewards of coordination within the United Nations system may be best achieved if the organizations identify the common goals to be pursued and agree upon the role of each organization in achieving those goals.

28. The importance and potential of space science and technology for the prosperity of the Earth and human beings are widely, although not sufficiently, recognized. While the organizations within the United Nations system engaged in space activities are making the benefits from space applications available to the international community within their respective mandates, further coordination of space activities among the organizations is emphasized by Member States. In view of the fact that the Third United Nations UNISPACE Conference (UNISPACE III) will be held in 1999 to prepare a global action plan in the peaceful exploration and exploitation of outer space for the twenty-first century, the time may have come for the organizations within the United Nations system to refine a set of common goals to be pursued in the applications of space science and technology and to prepare mid- to long-term strategies for increasing the impact of the work of the organizations within the system to best serve the international community.

III. ACTIVITIES PLANNED BY ORGANIZATIONS WITHIN THE UNITED NATIONS SYSTEM FOR 1997 AND 1998 AND FUTURE YEARS

A. Remote sensing and the Geographic Information System

1. Education and training programmes

Training courses, workshops and seminars

29. The United Nations Programme on Space Applications is planning the following training courses in the period 1997-1998:

(a) Seventh United Nations International Training Course on Remote Sensing Education for Educators, which is being organized in cooperation with the Government of Sweden, to be held at Stockholm and Kiruna, Sweden, from 5 May to 13 June 1997;

(b) Fourth United Nations/European Space Agency (ESA) Training Course on Applications of the European Remote Sensing Satellite (ERS) Data to Natural Resources, Renewable Energy and the Environment for English-speaking African countries, to be held at Frascati, Italy, in October 1997;

(c) United Nations/Committee on Space Research Workshop on Data Analysis Techniques, which is being organized in cooperation with the Government of Brazil and the Centre for Space Science and Technology Education in Latin America and the Caribbean, to be held in Brazil in November 1997;

(d) Eighth United Nations International Training Course on Remote Sensing Education for Educators, to be held in 1998.

30. The following training courses and workshop are planned by ESCAP for 1997 and 1998 with funding support from donors and co-financing and cost-sharing by participating States:

(a) Seminar with hands-on training in remote sensing and GIS for ecosystem management, to be held in August 1997 and 1998;

(b) Medium-term Training Course on Sustainable Land Use Planning, to be held from September to November 1997 and from September to November 1998.

31. ESCAP and FAO plan to organize jointly, in cooperation with ESA, for decision makers a Workshop on Integrated Applications of Remote Sensing and GIS for sustainable Development Planning, to be held in Asia in October 1997.

32. FAO plans to organize, jointly or on its own, the following remote sensing training courses, workshops and seminars in 1997 and in future years:

(a) FAO/German Foundation for International Development (DSE) workshop for decision makers on remote sensing and GIS applications, to be held in eastern Africa in 1997;

(b) FAO/DSE regional training courses on the application of remote sensing and GIS for sustainable forest management for Latin American and south-east Asian countries in 1997 and 1998;

(c) FAO technical workshops on land-cover mapping, to be held within the framework of the AFRICOVER project in 1997 and 1998.

33. UNESCO will continue to support the following postgraduate training courses in 1997, in 1998 and beyond:

(a) Postgraduate course on integrated study and rational use of natural resources at the Université de Paris, the Université de Montpellier and the Université de Toulouse;

(b) International postgraduate training course on applications of remote sensing, digital image processing and aerospace surveys for applied geomorphology and engineering geology at the International Institute for Aerospace Survey and Earth Sciences (ITC), at Enschede, Netherlands;

(c) International postgraduate training course on photo-interpretation applied to civil engineering and geology at the Instituto Geográfico Agustin Codazze, at Bogotá, Colombia.

34. UNESCO, in cooperation with Conservation International, Intel (United States of America) and Nippon Electric Company (NEC) (Japan), has introduced the use of remote sensing and GIS technologies in biosphere reserve management. Training courses on the use of GIS are being organized for managers in 25 biosphere reserves in developing countries.

35. UNESCO plans to organize in 1998, in cooperation with ITC and the World Wildlife Fund (WWF), a training programme on remote sensing and GIS technologies for the rehabilitation of panda habitats in China. The training programme will be for both scientists and managers.

Fellowships

36. In promoting the development of indigenous capability, the United Nations Programme on Space Applications, in cooperation with ESA, will administer, within the period 1997-1998, three fellowships for a period of one year of research and study; one fellowship in remote sensing instrumentation at the European Space Research and Technology Centre at Noordwijk, Netherlands, and two in remote sensing information systems at the European Space Research Institute (ESRIN) at Frascati, Italy.

37. ESCAP will organize advanced training courses in 1997 and 1998 for up to 15 professionals, providing specialized training in remote sensing and GIS applications through fellowship studies. The training will be arranged on a cost-sharing basis with an ESCAP project funded by the United Nations Development Programme (UNDP) on GIS and remote sensing. Fellowships will be provided by the host Government.

38. FAO will continue providing fellowships and organizing study tours within the framework of remote sensing technology transfer activities of field projects in the period 1997-1998.

Provision of training materials or facilities

39. ESCAP will conduct studies and surveys to prepare training materials, guidelines and inventories on regional remote sensing and GIS development applications. The following activities will be carried out in the period 1997-1998:

(a) Establishment of the Earth space information network for natural resources and environment management in Asia and the Pacific, in 1997;

(b) Publication and dissemination of guidelines on GIS standards and standardization procedures for natural resource and environment management and development planning, in 1997;

(c) Maintenance and updating of the Regional Information Services database on remote sensing and GIS, in 1997.

40. UNESCO through its Coastal Regions and Small Islands Unit, will carry out the following activities in 1997, in 1998 and beyond:

(a) Participation in the European Commission project "Computer-aided system for tele-interactive learning in environmental monitoring" with regard to the development of training programmes on the use of remote sensing and GIS technologies in coastal zone management on CD-ROM;

(b) Production of distance learning materials on the circumpolar region using remote sensing imagery, in cooperation with remote sensing institutions of Canada, Denmark, the Russian Federation and the United States;

(c) Development of lesson materials on the use and cost-effectiveness of remote sensing technologies for coastal habitat mapping and resource assessment, in cooperation with the University of Newcastle and the University of Sheffield in the United Kingdom of Great Britain and Northern Ireland.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

41. In 1997 and beyond, the Office for Outer Space Affairs of the Secretariat, within the framework of the United Nations Programme on Space Applications, will continue to collaborate with the Department for Development Support and Management Services of the Secretariat and ESA in follow-up activities related to the recommendations of the training courses on applications of ERS data to natural resources, renewable energy and the environment, held at Frascati, Italy, in 1993, 1994 and 1995. Efforts will continue to be made to identify

and implement support mechanisms to enable scientists from Africa, Asia and the Pacific, and Latin America and the Caribbean to receive and utilize ERS data for resource management.

42. In 1997 and 1998, ECA will continue to provide, upon request, its advisory services to member States to assist them in developing tools and methods for spatial integrated analysis. Particular attention will be given to ECA-sponsored training and service centres sponsored by ECA that are responsible for mapping, remote sensing and GIS applications when new medium-term programmes are implemented by the Regional Centre for Training in Aerospace Surveys (RECTAS) and the Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSSMRS). Requests were made by an ECA conference of ministers to evaluate regional training and service centres sponsored by ECA and to make proposals concerning their continued usefulness and ways to better rationalize, coordinate and harmonize their activities. In response to that request, ECA will pursue action to rationalize and harmonize those centres. Within the framework of the UNDP-funded project RAF/94/008, assistance has been provided for their rationalization, which started in June 1996 and will continue until June 1997. The project will review the recommendations of the ECA studies in consultation with the governing councils of the training and service centres.

43. ESCAP will conduct consultative meetings through missions to donor agencies to arrange for the cost-sharing and co-financing of regional GIS and remote sensing activities during 1997 and 1998.

44. The overall mission of the FAO Environment and Natural Resources Service is to contribute to and promote environmental and natural resource management and conservation in the context of sustainable agriculture and rural development. The Service provides technical support, including advisory services and the formulation, backstopping and evaluation of field projects, to about 50 developing countries in Africa, Asia, Latin America and the Caribbean and central and eastern Europe. In addition, FAO provides support to the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP) for their field project activities and to the World Bank concerning guidelines, harmonization and standardization.

45. FAO will continue to cooperate with the regional commissions and regional remote sensing centres in the efficient use of remote sensing technology for the mapping, assessment and monitoring of renewable natural resources and natural disasters. The priorities of this assistance will follow the recommendations of Agenda 21[1] of the United Nations Conference on Environment, held at Rio de Janeiro from 3 to 14 June 1992, and the recommendations of the World Food Summit, held at Rome from 13 to 17 November 1996, as well as international conventions on desertification, biodiversity and climate change.

46. FAO will provide, in 1997 and in future years, assistance to the Governments of Albania, the Islamic Republic of Iran and Pakistan in preparing for the rehabilitation of their agricultural sectors using an inventory of current land utilization based on satellite remote sensing and GIS technologies.

47. Following the successful completion of phases I and II of the FAO/United States Agency for International Development (USAID) project on the monitoring, forecasting and simulation of the Nile River, FAO will implement phase III of the project during 1997 and 1998 to assist the Government of Egypt in consolidating the results achieved in the earlier phases.

48. FAO will complete phase II of its regional remote sensing and food security early warning project for the member States of the Southern African Development Community (SADC) with funding from the Government of the Netherlands. FAO will also continue its sister project for the countries in the region of the Intergovernmental Authority on Development (IGAD) in cooperation with RCSSMRS and with funding from the Government of France. A similar project for western and central Africa has also been formulated.

49. FAO will continue its assistance to countries in the Caribbean subregion in establishing a land information system (LIS) based on aerial photography, satellite remote sensing and orthophoto mapping. At present, such assistance is being provided to Barbados, Belize and Trinidad and Tobago, and it may be provided to Brazil, Guyana, Haiti and Peru.

50. FAO will continue its assistance to countries in central Europe in increasing their capacities for agricultural and environmental applications of remote sensing and GIS. In particular, FAO will continue to offer advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in assessing and monitoring environmental damage. At present, such assistance is being provided to Albania, Czech Republic, Hungary, Poland and Slovakia.

51. FAO through its Technical Cooperation Programme, will be assisting the Government of Slovenia in 1997 and 1998 in designing an integrated action plan for reforming the cadastral and land valuation systems. Similarly, FAO is assisting the Government of Yemen in the development of an environmental information system (EIS) for the collection, analysis and evaluation of natural resources in the country, thus facilitating data collection management, the distribution of existing and new data and the establishment of a trained human resource base.

52. FAO is developing plans to establish during 1997 and 1998 a remote sensing and GIS-based environmental monitoring system in Baluchistan to facilitate sustainable management of forest resources.

53. FAO will continue to contribute, with the use of remote sensing technology, to the development of schemes to control animal pest diseases. Earlier studies relating normalized difference vegetation index data sets from ARTEMIS to tsetse distribution and land utilization types in Nigeria and Togo led to the establishment of an operational information system to define policies for African animal trypanosomiasis control. Remote sensing is used to define technical concepts for tsetse control in countries where high-resolution satellite images are available to discern land utilization types. A project is currently being prepared to design maps and GIS to assist 11 western African countries affected by onchocerchiasis.

54. In the field of agricultural statistics, FAO will continue to assist approximately 10 developing countries in satellite imagery techniques, which can be used for geographical stratification (subdivision in homogenous land units), area frame sampling, regression estimates and area sampling surveys.

55. FAO is preparing a complete coverage of Sierra Leone with satellite image maps on the scale 1:100,000 to support the preparation of land-cover maps by national experts.

56. UNESCO, in cooperation with the Center for Remote Sensing of Boston University in the United States, will assist the Omani authorities in 1997 in establishing a GIS and a digital image-processing laboratory.

Studies, pilot projects and operational applications

57. The United Nations International Drug Control Programme (UNDCP) is planning remote sensing activities with the use of ground, aerial and space means within the monitoring component of an alternative development project in Myanmar in order to estimate illicit opium poppy cultivation in the Wa region. Under this technical assistance project, an external agency will be engaged to carry out the monitoring activity. Cooperation with institutions working in south-east Asia is envisaged.

58. A holistic study initiated by UNDCP and published in April 1997 by FAO presented an overview of the problems associated with the monitoring of illicit crops and examined the potential for the use of remote sensing technology data in illicit crop production monitoring. UNDCP is presently considering the FAO study, which

will help to shape its future policy in this area. UNDCP policy is coordinated by its Division for Treaty Implementation and Policy Development, and its operational activities are coordinated by its Division of Operational Activities and External Relations.

59. UNEP, through its GRID network, maintains its linkage with providers and users of major remote sensing and information technology and applications to support a global cooperative assessment framework to address environmental issues of international significance. The results of its activities are circulated and/or transferred to its regional GRID centres at Bangkok, Geneva and Nairobi and form the basis of initiatives to be undertaken in 1997 and beyond for capacity development in data and database management in developing countries and in countries with economies in transition.

60. UNEP, through GRID-Geneva, cooperates with the Department of Humanitarian Affairs of the Secretariat in the development of the Global Information System on Natural Hazards, a "meta-database" of natural hazard databases established at various agencies and organizations throughout the world and provides GIS data for its Relief Web. Cooperation in disaster preparedness mapping will also continue with the Asian Disaster Preparedness Centre, through the UNEP Environment Assessment Programme for Asia and the Pacific, involving the GRID facility at the Asian Institute of Technology at Bangkok.

61. UNEP, through GRID-Sioux Falls, South Dakota, in the United States, cooperates with the Earth Resource Observation System Data Center (EDC) of the United States Geological Survey (USGS), in the development of added value data sets and techniques for change detection to enhance operational assessment and to meet reporting needs.

62. UNEP, through GRID-Sioux Falls, will continue the development of an environmental database of the Great Lakes Basin of Africa consisting of satellite-derived and other spatial data sets. UNEP is working with UNDP on assessing the value of the data sets in addressing the environmental information and management needs of the Basin.

63. UNEP, through GRID-Sioux Falls, in cooperation with the National Aeronautics and Space Administration (NASA) of the United States, USGS and the Environmental Protection Agency (EPA of the United States), will continue the development of a global database on river basin boundaries.

64. UNEP, through GRID-Sioux Falls, is collaborating with NASA, USGS, EPA, the United States Forest Service and the International Geosphere-Biosphere (Global Change) Programme in the development of a global database on land-cover characteristics using Advanced Very High Resolution Radiometer (AVHRR) data (with 1-kilometre resolution). The data, combined with the digital elevation models and river basin layers, significantly enhance the capability of UNEP to assess environmental effects in relation to major ecosystem boundaries. That capability was shown in the development of an ecoregion map of North America, in cooperation with USGS, EPA and Environment Canada under the North American Free Trade Agreement (NAFTA). For 1997 and beyond, plans are being made to undertake similar activities in order to develop ecoregion maps of other regions.

65. UNEP, through GRID-Sioux Falls, is collaborating with Environment Canada, the World Resources Institute and other organizations in the development of a global population database and a medium-resolution population database of Africa in a GIS format.

66. Following the completion of land-cover mapping for Bangladesh, Cambodia, Lao People's Democratic Republic, Myanmar, Nepal, Pakistan, Sri Lanka and Viet Nam, UNEP, through its EAP for Asia and the Pacific and GRID-Bangkok, will continue to support selected countries in developing data sets for land-cover assessment and monitoring in 1997.

67. Following the completion of a national land degradation assessment and mapping exercise for Kenya in 1996 (A/AC.105/631, paragraph 67), UNEP, through its Desertification Control Programme, will continue discussions to formulate a similar assessment programme for Mali using the results of a base survey conducted by the Institut géographique national - France international (IGN-FI). The work is being carried out in cooperation with the UNEP Division of Environmental Information and Assessment (DEIA) and GRID-Nairobi.

68. UNEP, through its Desertification Control Programme and GRID-Nairobi, has reviewed the *World Atlas of Desertification* and is preparing a revised edition for publication in 1997.

69. UNEP will continue the Soil and Terrain Digital Database (SOTER) activities in 1997 with the International Soils Reference and Information Centre and FAO. The SOTER database on the scale 1:5,000,000 for Latin America should be completed in 1997.

70. UNEP, through its DEIA and GRID network, continues to make substantive contributions to the work of the Committee on Earth Observation Satellites (CEOS).

71. UNEP and UNESCO will continue to work with the Scientific Committee on the Problems of the Environment of the International Council of Scientific Unions (ICSU) in 1997 and beyond.

72. UNEP and the Consultive Group on International Agricultural Research (CGIAR) jointly sponsoring a project on the use of GIS in agricultural research. The project, which is being implemented through GRID-Arendal in Norway, is helping to enhance the bilateral cooperation between the GRID facilities and CGIAR centres in various regions, such as the cooperation between GRID-Bangkok and the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) and International Rice Research Institute (IRRI), and between GRID-Nairobi and the International Council for Research in Agroforestry.

73. UNEP, through GRID-Nairobi, is working with Michigan State University in the United States to explore approaches to the development of national GIS that integrate environmental and socio-economic layers. A trial system developed for Rwanda has proved successful and could be used in the countries of the Great Lakes Basin of Africa.

74. In 1997 and beyond, UNEP, together with WWF and the International Union for the Conservation of Nature (IUCN), the World Conservation Union, will continue to support and cooperate with the World Conservation Monitoring Centre (WCMC) at Cambridge, United Kingdom, particularly on the development of data sets and databases relating to biodiversity resources and assessment.

75. UNEP, through GRID-Sioux Falls, is cooperating with Clark University in the United States in the development of methodology for environmental risk assessment and conflict resolution using GIS techniques.

76. In 1997 and 1998, ECA will undertake a series of technical studies and projects and will compile technical reports that will deal with, as essential components, mapping, remote sensing and geographic information systems, including the following:

(a) Preparation of a study on appropriate institutional and organizational framework to ensure an integrated and coordinated analysis of the nexus;

(b) Preparation of a publication entitled "Mapping and land information systems: proceedings of the Eighth United Nations Regional Cartographic Conference for Africa";

(c) Completion of the digital cartographic inventory atlas project.

77. In the biennium 1997-1998, ECA will establish a database on mapping and baseline spatial information on Africa, including coverage, date, formats, technologies in use, cadastral surveys and systems, physical and human resources, production capacities and other relevant factors such as gender participation and the role of the private sector. The database will also include information on educational and training facilities in the area of geoinformation.

78. ECA will cooperate with FAO in planning, coordinating and implementing activities of the AFRICOVER project.

79. During the biennium 1997-1998, ECA will coordinate with member States and relevant intergovernmental and non-governmental organizations the establishment of a working group on regional data standards for spatially related information.

80. ECE is conducting activities in the area of GIS in cooperation with Eurostat and the Organisation for Economic Co-operation and Development (OECD), within the framework of the Conference of European Statisticians. The objectives to be pursued by ECE in 1997 and the years that follow are to promote the development of statistical GIS, to design and develop new tools and technology, to exchange information on GIS software and to enhance international cooperation.

81. In the period 1997-1998, ESCAP will continue or will start the following studies and pilot projects in its region as collaborative projects to promote and customize remote sensing and GIS operational use in natural resource and environment monitoring:

(a) Coastal zone development and environment monitoring using integrated GIS and remote sensing technology;

(b) Integrated study on sustainable development in arid zones;

(c) Coastal zone environment management studies with emphasis on mangrove ecosystems and using integrated GIS and remote sensing technology.

82. The Economic and Social Commission for Western Asia (ESCWA) will conduct a study entitled "Assessment and promotion of research and development in the ESCWA member countries", which will be discussed in an expert group meeting to be held in September 1997. At the request of the Higher Council for Science and Technology in Jordan, remote sensing and its applications in the study of desertification will also be discussed as an important subject. It is envisaged that in both the study and the meeting there will be a discussion on the requirements for establishing a specialized network of institutions to cover a variety of remote sensing applications, such as urban planning, and monitoring of environmental pollution and desertification.

83. ESCWA has just finalized a technical report on the assessment of water resources in western Asia. In the study, available hydrological data were utilized to evaluate known water resource parameters and to generate groundwater maps. Satellite images and photomosaics were also analysed with the use of GIS technology in order to study drainage patterns, to relate drainage basins to major fracture zones and to assess the potential of groundwater in fracture zone aquifers. The purpose of the correlation was to formulate options for the development and/or management of groundwater resources in western Asia, particularly in the case of aquifers shared by two or more countries. During 1997 and the biennium 1998-1999, ESCWA will take follow-up action on the recommendations of the technical report, addressing primarily the need to develop a strategy for the utilization of shared water resources. The utilization of remote sensing technologies will be included in the strategy for designing specific projects, based on requests to be received from ESCWA member States and pending the availability of funds.

84. FAO and ESA will continue their cooperation in developing appropriate techniques for the application of satellite synthetic aperture radar (SAR) imagery to agriculture and forestry in developing countries. Similar cooperation has started between FAO and the Canada Centre for Remote Sensing. A pilot study on the use of ERS-1 and ERS-2 data for land-cover mapping in Africa was completed in 1996 and a joint report was published. Studies to analyse the potential applications of images from Canadian RADARSAT satellite for natural resource assessment, mapping and monitoring are being prepared.

85. FAO is continuing cooperation with the Government of France in developing operational methodologies for applications of high-resolution remote sensing data in international development projects through the implementation of pilot studies. Similarly, Russian high-resolution satellite imagery is being evaluated. The results are published in the FAO Remote Sensing series of technical publications and brochures for decision makers. In addition, the Government of France is supporting FAO in the field of standardization and harmonization of methodologies on the use of remote sensing and GIS techniques. Two publications for decision makers were issued on the use of remote sensing and GIS in forest fire management and forest decline assessment, based on pilot studies in Poland. Furthermore, a study on wetlands monitoring by ERS SAR data was published in early 1997.

86. A feasibility study and a user requirement study for a global operational forest-cover monitoring network based on satellite remote sensing, which were conducted by FAO in cooperation with the National Aerospace Laboratory (NLR) of the Netherlands and the Agricultural University of Wageningen, will be followed by a pilot project executed in cooperation with the Government of Ecuador.

87. The 1990 Forest Resources Assessment (FRA) project of FAO, a global survey of forest resources, demonstrated that information on changes in forest and land use could be obtained on a global basis in a cost-effective, timely and statistically sound manner. FAO concluded that such surveys, if continued over time, would lend factual support to global environmental researchers and policy makers by providing detailed descriptions of the processes of change and the quantification of essential parameters on a reliable basis. In view of the information needs of the international community, in particular, the need for studies on global changes, FAO intends to continue to build consistent and reliable time-series observations of forest and land use. FAO is currently preparing for a global forest resource assessment for the year 2000 that will make extensive use of remote sensing and GIS.

88. In this connection, FAO will consider the following recommendations in designing activities for 1997 and beyond:

(a) Statistical designs and analytical systems for series of transition matrices should be further developed:

(i) To use the auxiliary information such as the one on existing wall-to-wall forest classification based on AVHRR data (with 1-kilometre resolution) from the National Oceanic and Atmospheric Administration (NOAA) of the United States, as well as other statistical and spatial information databases (Forest Resource Information System, GIS layers);

(ii) To improve estimates for change by stratifying parameters that would reduce the variance of forest area changes such as demography, economic indicators and infrastructure;

(b) Sound monitoring procedures such as interdependent remote sensing analysis should be further promoted for their implementation to obtain location-specific information in order to assist decision-making;

(c) The vegetation classifications that have been adopted at the country level in response to local needs should be maintained, to the extent possible, compatible with global standards to allow for full contribution to the global base.

89. With the Government of the Netherlands, FAO is preparing a new cooperative programme, the Pilot Remote Sensing Processing and Archiving System for Forest Assessment and Monitoring (RESPAS). The project will produce geometrically corrected remote sensing data, optimized for forest applications, for national and subnational forest departments and the national tropical forest action programme units to establish and/or strengthen the capacity of developing countries to assess and monitor their forest resources. It could be further developed to be integrated with GIS and other databases, such as the Forest Resource Information System, and with simulation and modelling capabilities to assist in the planning and definition of forestry policies. The Tropical Forest Action Plan Coordination Unit and the field programme of FAO would be the main users. The project has already started with a user needs assessment in order to determine user requirements at the national level for managing forest areas and a preliminary outline for the RESPAS system concept. The countries that would be involved in the pilot project are Colombia, Guinea, Kenya and the Philippines.

90. FAO, through ARTEMIS, will continue the operational monitoring of growing conditions and vegetation development over Africa, based on Meteosat and NOAA-AVHRR data, for use in early warning for food security and desert locust control. It will include the distribution of ARTEMIS images by electronic means to authorized users, by way of an e-mail data server on the ARTEMIS server that was implemented in 1996. FAO, through technical assistance from its headquarters and its regional projects, will also continue to support the establishment, or improvement, of local reception and/or processing systems using low-resolution environment satellites, including the development of improved interpretation techniques and user-friendly software. The ARTEMIS system was significantly upgraded in 1996 to better satisfy the expanding needs of its users, as well as those of the scientific community. The rainy season performance assessment capability of the system was expanded to cover eastern Asia.

91. FAO will continue its work on sustainable management of agricultural, forestry and fishery natural resources and on its Global Information and Early Warning System (GIEWS) on food and agriculture with a view to increasing the use of remote sensing inputs and their integration with other inputs in GIS.

92. FAO will continue to assess existing forest resources and trends in deforestation, forest degradation and plantations. A number of pilot studies will be undertaken to test new data and to develop appropriate methodologies. An operational workplan is being prepared by the Joint Research Centre at Ispra and by FAO in order to integrate the use of NOAA-AVHRR defined by Tropical Ecosystem Environment Observations by Satellite (TREES) and the methodology used in the FRA project and AFRICOVER.

93. Within the framework of its inputs to ongoing and planned global environmental programmes such as GTOS, FAO will continue its cooperation with organizations within the United Nations system, specialized agencies and other international organizations by providing remote sensing expertise and by participating in pilot studies within its mandate. FAO also cooperates with UNEP and UNESCO by participating in working groups on the harmonization of land-use and land-cover classification.

94. FAO is contributing to the preparation of four projects of the Observatoire du Sahara et du Sahel (OSS):

(a) Assessment and monitoring of land degradation and desertification in countries in northern Africa, with the Centre régional de télédétection des États de l'Afrique du Nord (CRTEAN);

(b) Harmonization of the uses of NOAA-AVHRR and Meteosat data for environmental monitoring;

(c) Participation in AFRICAGIS, the main international forum on GIS and EIS technologies in Africa;

(d) Setting up of a long-term ecological observatory network (ROSELT) in Africa within the framework of GTOS activities.

95. FAO is continuing to cooperate with UNDCP on pilot projects to determine the location of narcotic crop cultivation sites using satellite remote sensing data. Planned studies will use high-resolution data from new optical and microwave Earth observation satellite systems. Increased use of GIS and expert systems for modelling and forecasting is also planned for 1997.

96. A technical capability for processing and distributing of ARTEMIS data for western and central Africa is currently being developed within the FAO Regional Office for Africa at Accra.

97. There are plans to extend the ARTEMIS vegetation index products to cover all of Asia and Latin America, in addition to the current coverage of Africa and south-east Asia. FAO has developed a 10-year CD-ROM archive of ARTEMIS vegetation data. A new programme named Reconnaissance and Management System of the Environment of Schistocerca (RAMSES) was scheduled to start in 1995, to be implemented for three years, with the support of the Government of Belgium. The objective of the programme is to improve the use of NOAA-AVHRR data for the early detection of locust areas in Africa. The programme will be carried out within the framework of the new FAO Emergency Prevention System for the transboundary plant pest and animal disease programme.

98. GIEWS has the unique responsibility of providing early warning of food security emergencies for the whole world. Remote sensing data from ARTEMIS and agrometeorological data and information are used as input in the evaluation and assessment process. The development of models to integrate satellite and agrometeorological data with socio-economic and nutritional information, using GIS technology, is currently being finalized under the GIEWS risk-mapping project. The project is being implemented by FAO in partnership with the Save the Children Fund in London and executed by GIEWS with financial assistance from the European Community.

99. The AFRICOVER project, which started in 1995 and will be implemented for more than five years, is aimed at establishing a land-cover digital database for and by each national and regional African competent body and to produce land-cover maps on the scale 1:250,000 (1:1,000,000 and 1:100,000 in certain cases), using the same geographic references and projection system in Africa, as well as a common harmonized legend, with updated information on drainage, toponym, roads and land-cover features, to list a few. It will be implemented in African regional and national remote sensing centres and mapping agencies under the supervision of FAO. Two workshops in 1996, held at Dakar and Addis Ababa in cooperation with ECA, defined a harmonized land-cover classification system and geometrical parameters. The eastern African component of AFRICOVER was started in 1995 with an Italian contribution of US$ 5.47 million and became fully operational at the RCSSMRS at Nairobi in January 1997. The World Bank, together with FAO, is preparing an important project in central Africa related to regional information on the environment (including deforestation and biodiversity) named the Regional Environmental Information Management Project (REIMP), which will be presented to the Global Environment Facility (GEF) and other donors in 1997. The AFRICOVER project represents a total budget of between US$ 30 million and 50 million, depending on the options taken.

100. FAO is continuing its efforts to optimize the use of remote sensing, GIS and agrometeorological technologies and to effectively transfer and integrate their use into the activities of its member States for enhancing: the timeliness and cost-effectiveness of data collection; inventory, monitoring and management of resources at various levels; and early warning and environmental monitoring.

101. FAO, under the coordination of its central GIS unit, is continuing to develop its digital atlas on agriculture, forestry, fisheries and sustainable development with a view to significantly improving access to its various types of data and other information, including those on the Internet.

102. In 1997 and beyond, FAO envisages the increasing use of GPS in surveys and the integration of remote sensing data into GIS-based land resource information systems. FAO is considering using remote sensing to assess and monitor the progress of soil and water conservation works carried out in the field within the framework of national programmes assisted by WFP.

103. The Investment Centre of FAO uses remote sensing data to supplement or update geographic information needed for the preparation of projects. In addition, it is incorporating more remote sensing components in projects concerned with the development and management of natural resources. Guidelines for the use of remote sensing in the design of investment projects are now ready for publication. An FAO publication on methodologies for rapid assessment will be ready in early 1997.

104. The Land Regulation Task Force, which has been established by several divisions within FAO, continues to coordinate activities related to LIS. LIS depends upon remotely sensed data, primarily aerial photographs and orthophotomaps, to construct effective multi-purpose cadastral and land record systems for land registration and administration.

105. The Intergovernmental Oceanographic Commission (IOC) of UNESCO will continue to contribute to the work of CEOS concerning the development of user requirements for sensors and data management systems within the framework of the GOOS programme.

106. Within the framework of its Man and the Biosphere programme, UNESCO continues to develop, in cooperation with UNEP, the National Institute for Research in the Amazon (INPA) of Brazil and the Institut français de recherche scientifique pour le développement et coopération (ORSTOM), a multidisciplinary research programme on the economic and ecological sustainability of tropical forest management in the central Amazonian region. Remote sensing technologies will be used for natural resource surveying and mapping.

107. Within the framework of a research project on the study of the natural resource potential of southern Libyan Arab Jamahiriya, UNESCO is proposing the establishment of a remote sensing GIS centre under its Great Man-Made River Authority.

108. Within the framework of the Geological Applications of Remote Sensing (GARS) programme, organized jointly with the International Union of Geological Sciences, UNESCO will continue to implement the following activities:

(a) The third phase of the GARS project in Africa concerning the creation of a regional remote sensing user network, in cooperation with the Royal Museum of Central Africa in Belgium: the network now includes Botswana, Burundi, Ethiopia, Rwanda, Swaziland, Uganda, United Republic of Tanzania and Zambia; moreover, remote sensing data interpretation capabilities will be added in the UNESCO Africa project called Pan-African Network for a Geological Information System, also implemented in cooperation with the Royal Museum of Central Africa and the Centre international pour la formation et les échanges géologiques of France;

(b) The final phase of the GARS project in Latin America, which focuses on mountain hazard and landslide mapping of the Andean subregion with the use of microwave spaceborne sensor data: the project results will be published in 1997;

(c) The first phase of the GARS project in Asia on the monitoring of pre-active volcanoes in the Philippines: the project is aimed at developing a new methodology for volcanic hazard assessment and prediction using remote sensing and GIS technologies.

109. UNESCO cooperates with the Council of Europe, within the framework of the latter's Open Partial Agreement on the Prevention of, Protection against and Organization of Relief in Major Natural and Technological Disasters, in conducting research studies related to the use of space technology in disaster management.

110. Using remote sensing and GIS technologies, UNESCO will continue to monitor, in close collaboration with relevant national authorities and international institutions such as ITC, selected cultural sites and historical cities inscribed in the World Heritage List, such as Angkor in Cambodia and Moenjodaro in Pakistan.

111. Within the framework of its space archaeology programme, UNESCO will continue to develop cooperation with space agencies, such as NASA of the United States, the National Space Development Agency (NASDA) of Japan and the Centre national d'études spatiales (CANES) of France, concerning the use of satellite data for field research activities such as archaeological site prospection and the extension of the study of archaeological sites in their geographical environment.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications and/or policy coordination

Dissemination of technological information

112. UNEP, through GRID-Sioux Falls, conducts the biennial comprehensive survey of GIS and image processing software systems to provide member States with up-to-date information about their status and trends. A report entitled, "Access to environmental data and information using Internet tools", which was prepared by GRID-Sioux Falls in 1996, is available for distribution to developing countries.

113. UNEP, through GRID-Sioux Falls, provides tens of thousands of users with access to environmental data and information through its World Wide Web site. Similarly, data and information resources of GRID-Arendal and GRID-Geneva are accessible through the Internet and the World Wide Web. UNEP will continue to enhance the dissemination of data and information of new GRID sites through the Internet and the World Wide Web as resources permit.

114. Through GRID-Arendal, UNEP is supporting the Arctic Environment Protection Strategy (AEPS). The GRID facility at Arendal is responsible for the maintenance of database source materials and GIS in cooperation with the Arctic Monitoring and Assessment Programme, the Conservation of the Arctic Flora and Fauna Programme, the Protection of the Arctic Marine Environment programme, and the indigenous people's programme of AEPS. Further expanding its links to Arctic environmental programmes, the UNEP GRID-Christchurch in New Zealand was officially opened in May 1996 and will focus on Antarctic environmental databases.

115. UNEP, through GRID-Arendal, also hosts the secretariat of the International Arctic Environment Data Directory. The Directory will be further expanded by the end of 1997 and will be open to all institutions located in the Arctic, or using directories of environmental information concerning the Arctic.

116. UNEP, through its network of GRID centres, developed the GRID Meta-data directory tool to provide both an electronic and hard-copy catalogue of worldwide GRID data sources. The tool provides a stand-alone package system which can run on a desk-top computer. It helps small centres, particularly those in developing

countries and countries with economies in transition, to manage their own data and make them available to others through the GRID network and the UNEP Environmental and Natural Resource Information Networking (ENRIN) project. The project promotes the development of data and database management capacity of partner institutions of UNEP in developing countries for environmental assessment. Approximately 50 partner institutions have already indicated their interest in the above-mentioned UNEP initiatives.

117. Although severely constrained by funding reductions in 1996 and 1997, UNEP strives to maintain the GRID network in order to disseminate reliable, geographically referenced environmental information to assist in addressing global, regional and national environmental issues. GRID-Sioux Falls and EDC have compiled an exhaustive list that has been distributed to all GRID centres. In addition, the information can be requested from Sioux Falls through the Internet and home page.

118. In 1997 and 1998, ECA will continue to publish its cartographic and remote sensing bulletin, of which five issues have been published, either as a separate publication or as a part of a more general publication comprising articles related to natural resources, food security and the environment.

119. In 1997 and 1998, ESCAP will continue to expand its national information network contact points to provide operational regional information services.

120. ESCAP will continue to publish the quarterly *Space Technology Applications Newsletter* (formerly called the *Remote Sensing Newsletter*) in 1997 and 1998. The biannual *Asian-Pacific Remote Sensing and GIS Journal* (formerly called the *Asian-Pacific Remote Sensing Journal*) will also be published during the same period.

121. ESCAP will also prepare, publish and disseminate the following special publications as part of its regular information service activities:

(a) Series of reports on problems and solutions in the applications of GIS and remote sensing for integrated natural resources and environment management, in 1997 and 1998;

(b) Reports on pilot projects conducted under the regional programme on remote sensing and GIS applications by member States, in 1997 and 1998;

(c) Proceedings of seminars, symposia, workshops and meetings organized by ESCAP in 1996, 1997 and 1998;

(d) Manual of guidelines for special applications of GIS and remote sensing, including guidelines for GIS and remote sensing systems for natural resources and environment management, in 1997;

(e) *Space Technology Applications Capability in Asia and the Pacific: An Inventory (1996-1997)*, in 1997;

(f) *Space Technology and Applications for Sustainable Development in Asia and the Pacific: A Compendium* (second edition), in 1999;

(g) Monograph on advanced Earth observation satellite technology applications for environmental monitoring and natural resource management, in 1999;

(h) Study on harmonization of various initiatives for promoting regional cooperation on space applications for sustainable development, in 1998;

(i) Study on spatial information infrastructure and information networking applications, including distance education, in 1998.

122. FAO disseminates information on its activities in the field of remote sensing and GIS in support of FAO programmes in agriculture, forestry, fisheries, sustainable development and food security through its home page (http://www.fao.org).

123. UNESCO will give support to the European Association for the International Space Year in the organization of two colloquiums on the use of space technology in the study of environmental problems in the Mediterranean and on the role of space technology in environmental management, to be held in Morocco and Hungary, respectively, in 1997.

Elaboration of strategies or plans for future applications programmes or systems and/or policy coordination

124. ECA plans to organize in 1997 or early in 1998 an ad hoc expert group meeting on guidelines for defining, structuring and developing integrated data sets required for policy analysis and the decision-making process concerning food security, population and environmental sustainability and their interrelationships, commonly referred to as the "nexus". The meeting will be followed by a workshop for decision makers on integrated geo-information systems needed for the management of the nexus issues.

125. In 1999, ECA will organize and service the Tenth United Nations Regional Cartographic Conference for Africa.

126. ECE will organize the fifth annual work session on GIS at Brighton, United Kingdom, from 22 to 25 September 1997. It is expected that the series of work sessions on GIS will continue in the following years. It is also expected that, within the framework of the activities organized by the work sessions, some methodological materials, such as GIS implementation guidelines, will be prepared based on the experiences of countries and international organizations in that field. The issues to be addressed at the 1997 session include the following: (a) major national policies affecting the design and implementation of GIS in statistical applications, as well as future plans; (b) the use of GIS to analyse local data and assistance in creating and presenting comparable statistics; (c) the role of GIS in the statistical production process, in particular in business process redesigning and total quality management; and (d) the use of GIS for the dissemination of statistical data, including the use of new media such as Internet for dissemination purposes.

127. ESCAP plans to hold the following seminars, symposia and meetings:

(a) Seminars and symposia on space applications in the implementation of the Beijing Declaration on Space Applications for Environmentally Sound and Sustainable Development in Asia and the Pacific, in 1998 and 1999;

(b) Annual meetings of principal investigators for monitoring research progress and the exchange of experiences in the use of advanced satellite data for environmental and natural resource management, in 1997, 1998 and 1999;

(c) Regional working group meeting on remote sensing and GIS, in May 1998;

(d) Fourth session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development in Asia and the Pacific, in May 1998;

(e) Meeting of the Inter-Agency Subcommittee on Space Applications for Sustainable Development in Asia and the Pacific, in May 1998;

(f) Regional dialogue meeting on harmonization of various initiatives for promoting regional cooperation on space technology applications for sustainable development in Asia and the Pacific, in June 1997;

(g) High-level expert group meeting in preparation for the second Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific, in 1998.

128. Within the framework of its Man and Biosphere (MAB) programme, UNESCO will synthesize and publish the most recent GIS case studies on biosphere reserve management in developing countries. A task force for biosphere reserve data management is being set up to formulate strategies, tactics and technical protocols for the improvement of biosphere reserve data management, including the use of GIS and remote sensing technologies, and to plan future activities.

4. Capacity building

129. UNEP has reconstituted its Environment Assessment Programme (EAP) as the Division of Environmental Information and Assessment (DEIA). DEIA administers the environmental information networking programmes, such as the GRID and ENRIN programmes, which focus on formulating environmental information systems and building the data management capacity of UNEP partner agencies in developing countries and in countries with economies in transition. The programmes strive to complement existing efforts as far as practicable within the operating framework. UNEP is maintaining and forging new links with other organizations within the United Nations system, particularly, UNDP and its Office to Combat Desertification and Drought (formerly called the United Nations Sudano-Sahelian Office), the United Nations Institute for Training and Research (UNITAR), FAO and WMO.

130. UNEP continues its capacity-building and networking activities in Africa under ENRIN by holding workshops for the eastern African subregion in cooperation with IGAD. An information networking strategy has been developed with IGAD, and resource mobilization action is under way.

131. UNEP also cooperates with SADC in the development of institutional capability in environment and land management in the region and in the establishment of environmental and natural resource information networks. A number of networks have been established, notably in Zambia.

132. UNEP continues to provide technical backstopping assistance, through GRID-Nairobi, to Botswana, Burkina Faso, Côte d'Ivoire, Ghana, Kenya, Lesotho, Mozambique, Niger, Uganda, United Republic of Tanzania and Zambia. Significant networking activities are under way in Eritrea and Ghana in 1997 in cooperation with the UNDP Office to Combat Desertification and Drought. A major coordination effort is being made by the French Ministry of Cooperation, members of the Advisory Committee on Environment Information Systems in Sub-Saharan Africa, sponsored by the World Bank, UNEP, the UNDP Office to Combat Desertification and Drought, the Gesellschaft für Technische Zusammenarbeit, USAID and the Norwegian Agency for Development Cooperation (NORAD) to support the Committee, which provides a forum for coordination and exchange of ideas.

133. UNEP provided support to develop and strengthen the national database capabilities of Kenya, Uganda and the United Republic of Tanzania under the UNDP/GEF regional biodiversity project, implemented by FAO. The project was completed and a second phase is now under review.

134. UNEP/DEIA and ENRIN activities in Asia and the Pacific also focused on data networking and related capacity building in support of environmental assessment. UNEP and five subregional organizations (the Association of South-East Asian Nations, the International Centre for Integrated Mountain Development (ICIMOD), the Mekong River Commission, the South Asia Cooperative Environment Programme and the South Pacific Regional Environment Programme) agreed to take a complementary approach to capacity building in reporting on the status of the environment and database management. The programme in Asia and the Pacific now has links to 40 countries in complementary activities with the subregional intergovernmental bodies. The development of core data sets related to the status of the environment is continuing at various levels. The data sets are archived and maintained at GRID-Bangkok for dissemination to organizations and individuals. The GRID facility is incorporated in the outposted DEIA programme centre at the campus of the Asian Institute of Technology at Bangkok. UNEP has also established a regional directory of environmental institutions, experts and data listed by country.

135. UNEP continues to seek support from donor organizations to undertake complementary and/or joint activities in developing the necessary capacities in countries and in relevant international governmental organizations. Current partner organizations of UNEP are UNDP, the Asian Development Bank, the Danish International Development Agency (DANIDA), the Finnish International Development Agency (FINNIDA) and the Gesellschaft für Technische Zusammenarbeit, which are significantly contributing to environment information capacity development at the national level.

136. UNEP collaborates closely with the Statistics and Natural Resources Division of ESCAP, the UNDP Regional Office for Asia and the Pacific, the Asian Disaster Preparedness Centre, ICIMOD and the CGIAR centres such as IRRI and ICRISAT.

137. UNEP, through GRID-Arendal, also implements the ENRIN programme in countries in transition in central and eastern Europe. Eighteen out of 27 countries in the region have participated in the programme, and environmental information systems have been thoroughly evaluated and reports have been published for 12 of those participating countries. Three more reports are currently in preparation. One operational GRID centre, GRID-Warsaw, has been established and three more GRID centres will be established in 1997: at Budapest, Moscow and Tbilisi. UNEP has assisted seven countries in making their reports on the status of the environment available on the World Wide Web. UNEP continues to place strong emphasis on inter-agency cooperation in that area, particularly with the Department for Policy Coordination and Sustainable Development of the Secretariat, the Office of the United Nations High Commissioner for Refugees (UNHCR), UNITAR, ECE, UNDP, European Centre for Environment and Health of WHO, the World Bank, the Regional Environment Centre in Hungary, OECD and the European Community, through the European Environment Agency, GEF, Poland Hungary Aid for Reconstruction of Economies, Technical Assistance to the Commonwealth of Independent States and the World Conservation Monitoring Centre (WCMC). Through GRID-Geneva, UNEP maintains cooperation with regional intergovernmental bodies concerned with the Baltic Sea, the Danube Basin, the Black Sea, the Caspian Sea, the Mediterranean and the Aral Sea.

138. UNEP is continuing its capacity-building and networking activities in Latin America and the Caribbean in 1997. Following the subregional surveys, discussions with a number of intergovernmental bodies are under way on the formulation of environmental information networking and associated capacity development projects on data management. UNEP is discussing Centro Internacional para la Agriculturala Tropical (CIAT), a collaborating CGIAR centre, about a major project to analyse and compile indicators on the status of the environment to improve the assessment and monitoring of the state of the environment in the region.

139. In 1997 and 1998, ECA will focus its main activities in remote sensing to improve the capacity of member States to analyse and manage the interrelationship of food security, population and environmental sustainability, commonly referred as the "nexus".

140. ESCAP will assist its member States in establishing an Earth Space Information Network in Asia and the Pacific (ESINAP) to promote the sharing of Earth observation data for sustainable development planning. Following a pre-feasibility study and a feasibility study carried out in 1995 and 1996, a prototype ESINAP system will be developed with the participation of eight ESCAP member States in its Phase-I activities. An operational test on the system using Internet as a backbone will be carried out in 1997.

141. A multidisciplinary mega-project for research and studies on advanced satellite data applications, launched in 1996, will be carried out over the next three years. Twenty research teams from 15 States (Bangladesh, China, India, Indonesia, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand and Viet Nam) will deal with the primary utilization of data from multiple or individual Advanced Earth Observing Satellite (ADEOS) sensors with a focus on calibration and validation, algorithm development and global change studies.

142. ESCAP will undertake technical advisory service and consultancy missions in its member States on the applications of GIS and remote sensing in integrated natural resource and environment management in 1997 and 1998. Those missions will assist in promoting space technology applications for sustainable development, with emphasis on policy issues and institutional building, and in strengthening national capabilities in space applications or development, with emphasis on remote sensing and related GIS applications.

143. FAO, through its AFRICOVER project, contributes to strengthening African capacities in advance geographic information technologies on environment and natural resources. The value of the AFRICOVER project is not merely in the usefulness of the maps and databases to be produced; the elaboration of such maps will initiate capacity-building efforts in Africa through the development of national information systems on the environment and natural resources, crop assessment and food security, land management and large watershed management, preparation of investment field projects and locust and desertification control.

144. The main emphasis of the activities of FAO in the field of agricultural applications has been placed on the systematic enhancement of the national capacities of existing institutes whose mandates lie in implementing activities involving remote sensing, natural resource monitoring and mapping. The current tendency is to implement projects whose operational capacity has been vital to larger programmes. The following activities will continue to be carried out in the period 1997-1998 for the above-mentioned purposes:

(a) *Nile basin*: Through the effective development of an operational remote sensing capacity to receive Meteosat satellite imagery for the Blue and White Nile data, Meteosat-derived rainfall information is calibrated and fed into forecasting models to provide up to three weeks' advance notice of river flow at critical points along the Blue Nile;

(b) *Egypt*: Egypt has been the focal point for two other important institution-building projects assisted by FAO. The first project is located at the Desert Research Centre, which has the capacity to monitor the delicate ecological balance of Egyptian rangelands. The Centre will also supply data to the OSS programme. The second project is located at the Soil and Water Research Institute of the Ministry of Agriculture. Remote sensing is also used for operational soil mapping within the delta, and regular crop acreage estimates are made for the major crops each season;

(c) *Côte d'Ivoire*: FAO is involved in the preparation of an environmental information policy with the World Bank;

(d) *Afghanistan*: A project for land-cover inventory on the scales 1:100,000 and 1:250,000, based on satellite remote sensing, is being implemented. It will provide the basis for assessing the change in area cultivated or lost during the 13 years of war. The historical perspective of land-use changes has been provided

from existing maps and photographs which have been digitized and will be compared with the current situation. All these documents will be used for land-use policy planning;

(e) *Pakistan*: FAO is assisting in the establishment of an environmental monitoring unit at the forestry department of the regional government of Baluchistan and the installation of hardware and software and a database for environmental monitoring;

(f) *Eastern Africa*: FAO is conducting a pilot study on the identification of aquaculture sites, using NOAA-AVHRR and ERS-1 data.

145. The project proposal for a Land Cover Map and Digital Database of Africa, which was formulated by FAO and endorsed by the United Nations Inter-Agency Meeting on Outer Space Activities, is now being submitted by African countries to potential donors.

146. FAO should retain the capability to play an active role in building the capacity of and otherwise strengthening national and regional bodies, especially in developing countries, through:

(a) Training for decision makers and project managers;

(b) Support to national and regional centres (consultancy for equipment, maintenance, organization, training courses for technical staff);

(c) Technology transfer from headquarters to countries and regions (early warning systems, projects, pilot action studies);

(d) Support to national environment administrations concerning environmental information systems and environmental policy formulation.

B. Communications and navigation

1. Education and training programmes

Training courses, workshops and seminars

147. The United Nations Programme on Space Applications is planning the following workshops in the period 1997-1998:

(a) United Nations/ESA workshop on the cooperative information network linking scientists, educators, professionals and decision makers in Africa (COPINE), to be held in Africa in the fourth quarter in 1997;

(b) United Nations International Workshop on Satellite Communication Technology for Capacity Building, being organized in cooperation with the Government of Israel, to be held at Haifa, Israel, from 21 to 25 September 1997.

148. ECA will organize the following symposia and workshops in 1997, 1998 and future years:

(a) Symposium on the African Information Society Initiative (AISI), the contribution of ECA to the Conference on the Knowledge for Development in the Information Age, including a multi-media presentation on AISI;

(b) Symposium on the importance of AISI, utilizing information and information technology to build competitiveness of African economies and society, policy reforms to provide supportive environment (three symposia to be held in 1998 and 1999);

(c) Three workshops on the importance of AISI, utilizing information and information technology to build competitiveness of African economies and society;

(d) Two workshops on developing African information content and building African Web sites;

(e) One workshop on the use of information technology to access African development information.

149. ESCAP plans to hold, with both multilateral and bilateral funding support from donors, a regional seminar on satellite communication applications for distance education in September 1997 at Manila.

150. ICAO is conducting activities to face new challenges concerning human resources involved in the introduction of advanced satellite-based communications, navigation and surveillance and air traffic management (CNS/ATM). ICAO, which recognizes that an adequate number of people should be trained or retrained in the use of new technologies, addresses human resource planning and training issues through its TRAINAIR programme, which provides a mechanism for cooperation among training centres for the development of the many new training courses that are required.

151. The ITU Radiocommunication Bureau will be organizing world seminars every two years and regional seminars in the intervening years on frequency management, the use of the geostationary-satellite orbit and preparatory activities for the radiocommunication conferences with a view to providing technical assistance to the participating countries.

152. The ITU Telecommunication Development Bureau (BDT) conducts, within the Buenos Aires Action Plan for Global Telecommunications Development, round tables and seminars on telecommunication policies, strategies, research and development for developing countries, training of staff from developing countries in various areas of telecommunications, use of GMDSS and mobile satellite communication.

Fellowships

153. The United Nations Programme on Space Applications, in cooperation with ESA, administers one fellowship for research and study in communications systems and another fellowship for research and study space antennas and propagation at the European Space Research and Technology Centre at Noordwijk, Netherlands.

154. ITU continues to provide fellowship support for candidates from developing countries to participate in its meetings.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

155. In the period 1997-1998, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will continue to provide technical advisory services to the Government of the Republic of Korea in support of the activities of the Asia-Pacific Satellite Communications Council.

156. The ECA secretariat will continue to provide expert services to the following meetings:

(a) Ad hoc expert group meeting of the African Technical Advisory Committee on AISI to discuss and synthesize recommendations regarding: norms and standards for wide connectivity; sharing and dissemination of development information on harmonization of info-structure and infrastructure in the region; and targeting experts on electronic data interchange and connectivity;

(b) Technical Advisory Committee on AISI (Committee resolution 812 (XXXI) of 8 May 1996).

157. The ECA secretariat will provide advisory services, on request, to member States on the following: (a) the development of national information and communication infrastructure plans and operation; (b) development of information content an establishment of Web sites; and (c) development of national information and communication infrastructure plans appropriate for maximum utilization of modern information technology and its effective operation in the region.

158. UNESCO, as a member of the Inter-Agency Consultative Committee, is acting in an advisory capacity and is providing assistance to the RASCOM project.

159. Activities of the ITU in the area of satellite communications include the following:

(a) BDT will continue to provide, at the request of administrations of member States that are developing countries, experts to participate in satellite Earth station projects and in the planning of regional or domestic satellite communication systems. Documents prepared by BDT, such as telecommunication development plans, master plans or sectoral studies, usually include a satellite component;

(b) Administrations of member States will continue to be kept informed on a regular basis, through the weekly circulars of the Radiocommunication Bureau and the special sections annexed thereto, of the basic technical characteristics, frequency assignments and orbital positions of space systems communicated to the Bureau. This information is also made available on Internet.

Study, pilot projects and operational applications

160. In 1997 and beyond, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will continue its collaboration with several African and European countries on the implementation of the COPINE project. COPINE is a satellite-based information exchange network among African professionals, educators, scientists and decision makers at the national, regional and international levels. The project is aimed at strengthening the capabilities of African countries to better respond to various needs of society, particularly to humanitarian needs, in rural and urban areas. COPINE is to support information exchange needs in the initial priority development areas, such as health care and education, including tele-health and tele-education. Other areas of COPINE system applications include environment management, sustainable agriculture, food security, natural resources development and science and technology research. A meeting of the provisional board of governors of COPINE, to be held in July 1997 in Finland, is expected to endorse the final COPINE projet document developed at an expert meeting held at Windhoek, Namibia, from 19 to 23 May 1997.

161. In the period 1997-1998, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will elaborate a project proposal addressing the priority needs of small island developing States in the Caribbean, with emphasis on coastal zone management and disaster preparedness. The Caribbean Disaster Emergency Response Agency is a co-partner in this project.

162. UNEP will continue, in 1997 and 1998, the development and implementation of Mercure, a satellite-based telecommunications system designed to improve global access to environmental information. Mercure consists of an initial configuration of 16 International Telecommunication Satellite Organization (INTELSAT) Earth stations donated by six ESA member States: Austria, Belgium, Norway, Spain, Switzerland and United Kingdom of Great Britain and Northern Ireland. It will use INTELSAT satellites in geosynchronous orbit over the Indian and Atlantic oceans. The installation phase of the Mercure project is nearing completion, and the operation build-up phase has begun. Construction of the initial suite of Earth stations is set for completion by the end of 1997. High-capacity Earth stations have been established at Arendal, Norway, and at Bangkok, Beijing, Geneva and Nairobi. One Earth station is under construction at San José, Costa Rica, and there are plans to establish another in Moscow. The stations will serve the information management needs of national and regional environment authorities, as well as UNEP headquarters and regional offices. Lower-capacity stations to meet such needs of national environment agencies have been established at Alma-Ata, Hanoi, Havana, Katmandu, La Paz, Manama, Maputo, Niamey and Vienna.

163. To improve access to information, consistent with the objectives of chapter 40 of Agenda 21, UNEP has also developed UNEPnet, an international environmental internet that will better meet the information management needs of UNEP partners and users of environmental information worldwide. Mercure is essential to the viability of UNEPnet in developing countries and in countries with economies in transition, providing an exciting application of satellite telecommunications for global delivery of environmental information products. Modern and cost-effective data communications, both within UNEPnet and through links to Internet, will enable timely access to comprehensive environmental and sustainable development information. The technology standards of Internet, combined with flexible and adaptive access services, provide the broadest basis for information outreach today and include commonly used Internet tools such as electronic mail and World Wide Web services to improve the access and exchange of environmental information throughout the world.

164. ECA will carry out field projects with United Nations partners to implement AISI.

165. In the biennium 1997-1998, ESCAP will implement a project on the study of satellite communication applications for distance education in Asia and the Pacific. The study will assess the present status of satellite-based distance education by examining the satellite systems used, space and ground segment technologies, the services currently provided, institutions providing distance education, the needs of the countries in the region and possibilities for regional cooperation. The study will also help to define a pilot project on distance education using communication satellite technology for implementation in a group of selected ESCAP member States.

166. UNESCO is continuing to examine different ways and means of making wider use of low- and geostationary-orbit satellite systems for communication, information, informatics, education, science, culture and environmental protection in the implementation of programmes and projects such as the following:

(a) Within the framework of the recovery plan of the Pan-African News Agency, the African Network for Integration and Development (RAPIDE) is being established. RAPIDE is aimed at ensuring the strong presence of Africa on the economic, scientific, social and cultural fronts, on Internet, which will thus be used as catalyst for the continent's economic development of the continent. On the technical front, RAPIDE will use the connecting facilities offered by the International Society of Aeronautical Telecommunications (SITA);

(b) Within the framework of the International Commission on Education for the Twenty-First Century (Delors Commission), UNESCO will continue to assess, evaluate and study the experience achieved in distance education, as well as the impact of new communication and information technologies, in particular, communication satellites applicable to distance education.

167. Within the framework of the UNESCO initiative "Learning without Frontiers", which fosters lifelong education for all at all levels, a joint ITU/UNESCO pilot project on education application of interactive television will be implemented. The project, which supports the teaching of primary teachers in developing countries, consists of providing sound and visual images to the "virtual classrooms". The return path enables the viewer to communicate by voice and data channels with the broadcast site. While UNESCO will be responsible for the conceptual aspects and educational content, ITU, which is developing the standards, will take primary responsibility for the technical implementation and choice of technological solutions.

168. UNESCO will establish a satellite-based network for distance education in central and eastern European countries to provide "cross-border" educational and training services, such as the provision of course material, interactive television and computer and video conferencing, to students in those countries. A number of educational and research centres in central and eastern Europe, including the UNESCO Institute for Information Technologies in Education in Moscow, will participate in the network, for which extrabudgetary support will be sought for implementation over a period of three years. Using the same techniques, the project could be extended to countries in other regions, such as Africa, Asia or Latin America.

169. ITU will continue to contribute in this sphere through the following activities:

(a) In the light of technological development, ITU radiocommunication study groups 1, 3, 4, 7, 8, 10 and 11 will pursue studies on technology and spectrum/orbit utilization for space communications. The radiocommunication study groups are part of the ITU Radiocommunication Sector, which is responsible for studying technical, operational and regulatory/procedural questions on radiocommunication, issuing recommendations and preparing the technical basis for radiocommunication assemblies and world radiocommunication conferences;

(b) The Telecommunication Standardization Bureau of ITU will continue its work through several study groups on the application of space technology in different services, including aeronautical mobile, maritime mobile and land mobile services, telecommunication services to remote regions and weather forecasts. The Bureau will also continue its work on the integration of satellite systems into the general telecommunication network. Many study groups of the Telecommunication Standardization Sector and the Radiocommunication Sector of ITU contribute to this work by developing recommendations and drawing up specifications. The sectors also prepare recommendations in order to ensure continuing and full integration of the satellite transmission medium in public digital networks, including the integrated services digital network, taking into account emerging technologies, applications and services;

(c) Following the decisions of the World Telecommunication Standardization Conference (WTSC), held at Helsinki in 1993, an intersectoral coordination group has been established between the Telecommunication Standardization Sector and the Radiocommunication Sector of ITU with a view to coordinating the direction of studies on future public land mobile telecommunication systems in particular relating to their satellite component. The intersectoral coordination group will also coordinate the review of recommendations on satellite matters prepared in both sectors. WTSC-96, held at Geneva from 9 to 13 October 1996, endorsed the continuation of that coordination function;

(d) BDT is continuing its work to implement the Buenos Aires Action Plan for Global Telecommunication Development, which was adopted by the first World Telecommunication Development Conference (WTDC), held at Buenos Aires in March 1994. The implementation of the Buenos Aires Action Plan for Global Telecommunication Development will enable the agreed goals and objectives to be reflected in a concrete work programme for the period 1994-1998 and will make telecommunications a principal factor contributing to sustainable development. The Buenos Aires Action Plan for Global Telecommunication Development comprises the following three parts: a programme of cooperation among the members of the

Telecommunication Development Sector of ITU; a BDT plan of action for assisting developing countries; and a special programme for the least developed countries. The second part of the Buenos Aires Action Plan for Global Telecommunication Development consists of 12 programmes, including programmes on the following: policies, strategies and financing; human resource management and development; frequency management; integrated rural development; and broadcasting infrastructure. Satellite communications are an integral part of the programmes. The Buenos Aires Action Plan for Global Telecommunication Development mainly refers to coordinated regional and global activities. It is expected that these activities will be complemented by multilateral and bilateral projects executed or supported by ITU and its development partners;

(e) Within the framework of the Buenos Aires Action Plan for Global Telecommunication Development, which listed as a priority item the need to increase the accessibility of telecommunication services in rural and remote areas in developing countries, ITU launched in 1994 an interregional project called Space Communications Technology Applications (SPACECOM) for developing countries. The project was designed by BDT, in association with industry. The project seeks to promote the broad applications of space communications technology in developing countries, which would greatly contribute to the development of the countries concerned and the satellite communication industry by forging a strong partnership between the space communications industry and the telecommunication operator and user community in developing countries. Satellite communication technology may well provide a low-cost means of establishing various types of telecommunication services (telephony, video, data) anywhere in the world, but many obstacles still stand in the way of its application in developing countries.

170. Although the involvement of ITU in the RASCOM project formally terminated in December 1993, ITU is following its activities and coordinating with the Pan-African Telecommunications Network, since the two systems (satellite and terrestrial) are complementary (A/AC.105/551, paras. 151 and 152). In particular, rural and remote areas will have to be linked to the networks through either of the above systems.

171. WTDC-98 will discuss, among other subjects, the progress made in the implementation of the Buenos Aires Action Plan for Global Telecommunication Development, as well as the SPACECOM and RASCOM projects.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

Dissemination of technological information

172. UNEP continues to actively promote the exchange of data and other information through the International Environment Information Exchange and Referral System (INFOTERRA) with national focal points in 173 countries. INFOTERRA supports a number of clearing-house mechanisms and maintains a subscription list for environmental queries and a Gopher node on Internet. UNEP is promoting telecommunications methods, including satellite-based communication for the above-mentioned and other methods to exchange and disseminate environmental information. Mercure/UNEPnet will be used as the core of this service to link regional offices with UNEP headquarters at Nairobi.

173. UNEP continues to maintain the International Cleaner Production Information Clearing House as a source of environmental information to promote the concept of cleaner production on a global scale. One addition to the above is the Clearing House for Information on the Global Programme of Action relating to Land Based Sources of Marine Pollution.

174. ECA will prepare and disseminate the following publications:

(a) Training modules for planners and decision makers on the following: (i) the importance of AISI; (ii) developing African information content: training modules for planners; and (iii) how to utilize information and information technology to build competitiveness of African economies and society (1998);

(b) Case study report on the best policies for development information and communication infrastructure;

(c) Report on the use of information and communication technologies to stimulate economic growth: case studies on best practices (1998);

(d) Newsletter on development information in electronic and printed formats (two issues);

(e) Training module on developing norms and standards for African information content (annual);

(f) Training module on building Web sites (1998).

175. In the period 1997-1998, ESCAP will publish and disseminate, as part of its regular information service activities, the report of the study on the status of satellite communication applications for distance education in Asia and the Pacific.

176. ITU will continue to contribute in this sphere through the following activities:

(a) Its Radiocommunication Bureau periodically publishes approved recommendations, either new or revised, on space radiocommunications. Publications of special interest for space radiocommunications concern issues on space applications; fixed-satellite, mobile-satellite, radio determination-satellite, amateur-satellite and broadcasting-satellite (sound and television) services; satellite news gathering; frequency sharing; and compatibility of different services. They form the basis for harmonious technical development of space radiocommunication systems and contain criteria for the sharing of frequency bands between the various space services, as well as between space and terrestrial systems;

(b) The third edition of the ITU *Handbook on Satellite Communications (Fixed-Satellite Service)* and the *Handbook on the Mobile-Satellite Service* are under preparation;

(c) The Radiocommunication Bureau publishes a quarterly updated list of orbital positions and associated frequency bands of space stations on board geostationary satellites and non-geostationary space systems. In more detailed form, it publishes all the technical characteristics of satellite networks submitted to it under the coordination or notification procedures, for recording in the Master International Frequency Register. This information is also available on Internet.

Elaboration of strategies or plans for future applications programmes or systems and/or policy coordination

177. ESCAP plans to hold, with both multilateral and bilateral funding support from donors, a meeting of the Regional Working Group on Satellite Communication Applications in March 1998 at Kuala Lumpur.

178. ITU will organize the World Telecommunication Policy Forum (WTPF) to discuss and exchange views and information on broad telecommunication policy issues, technological advances, infrastructure development and financial business considerations. The second WTPF, which will be held in conjunction with other ITU meetings, such as WTDC-98, will probably be devoted to policy and regulatory issues raised by agreement on trade in telecommunication services or by the Global Information Infrastructure and the Global Information Society.

179. ITU organizes on a quadrennial basis the World Telecommunication Exhibition and Forum (TELECOM), at Geneva, as well as similar four-year rotational regional events in the Americas, Asia and Africa. Asia TELECOM-97 is to take place in Singapore from 9 to 14 June 1997. ITU has also taken the initiative in organizing the TELECOM Interactive 97 Forum and Exhibition, which will take place at Geneva from 8 to 14 September 1997. It is hoped that it will bring a new and clearer vision of the complex world of multimedia services and interactive applications. The theme of the event will be "Towards a Strategic Plan for the Global Information Society". Africa TELECOM-98, which is to take place from 4 to 10 May 1998, will be the first ITU event organized in democratic South Africa. The venue and theme will be announced shortly. World TELECOM-99 will be the eighth TELECOM; it will take place at Geneva from 10 to 17 October 1999. Problems related to the ever-increasing uses of outer space, such as communication satellites, remote sensing and navigational services, as well as direct satellite broadcasting to rural and underdeveloped areas of the world will be some of the main issues of concern and discussion at these forums.

4. Regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services

180. ITU is preparing for the world radiocommunication conferences (WRCs) in 1997 and 1999. The purpose of these conferences is to update the international radio regulatory processes and prepare for future requirements. WRC-97, which will take place at Geneva from 27 October to 21 November 1997, is expected: to provide procedures to facilitate the use of frequency bands for mobile-satellite services; to allocate new frequency bands for space services for different applications including communications, Earth-exploration satellites and space research; and to review the plans for broadcasting-satellite services and associated feeder-links in regions 1 and 3 in the 12 GHz, 14 GHz and 17 GHz frequency bands contained in appendices 30 and 30A of the Radio Regulations. WRC-97 will also prepare the agenda of WRC-99 for approval by the ITU Council.

181. The Conference Preparatory Meeting (CPM), which has been established to carry out the necessary preparatory work for WRC, will continue its work. The ITU Radiocommunication Sector study groups are conducting studies in the field of space radiocommunications concerning technical aspects of mobile-satellite, fixed-satellite, Earth-exploration satellite, meteorological satellite, space research, space operation and broadcasting-satellite services and low-orbit satellite systems. The report to WRC-97 will be prepared by the CPM-97 in order to assist the ITU members who will be involved in the deliberations of WRC-97.

182. Technological progress, politico-social structural changes around the world and their impact on the liberalization of telecommunication services, the introduction of non-geostationary satellite systems for commercial communications and other elements prompted the Plenipotentiary Conference of the International Telecommunication Union held at Kyoto, Japan, in 1994, to call for, in its resolution 18, a new in-depth review of the ITU spectrum/orbit resource allocation procedures in order to ensure more efficient use and equitable access to those resources. The review is being coordinated by the Radiocommunication Bureau of ITU. A final report summarizing the results of studies by different groups within ITU will be presented to WRC-97 with a view to deciding on ways of incorporating new procedures and mechanisms into the ITU legal regime in order to increase efficiency and equity in spectrum/orbit utilization.

183. The ITU Plenipotentiary Conference in 1998 will consider the results of the review of the ITU spectrum/orbit resource allocation procedure.

5. Studies on and/or preparations for the establishment of new legal frameworks or the development of new systems to complement the existing legal frameworks

184. Following the International Symposium on Communication and Copyright in the Information Society, organized by UNESCO at Madrid from 11 to 14 March 1996, two committees of regional experts on communication and copyright in the information society met: one, for Latin America, the Caribbean States and Canada, at Bogotá in September 1996; and the other, for Asia, the Pacific and the Middle East, at New Delhi in November 1996. The Committee of Regional Experts on Communication and Copyright in the Information Society for the European States will meet in Monaco from 15 to 19 September 1997, and the Committee for African States will meet in 1998. One of the purposes of the meetings is to assess the basic infrastructure of various segments of information superhighways, mainly the convergence of telecommunications, broadcasting, including satellite broadcasting, and electronic networks. The conclusions reached by the regional committees will help the States, *inter alia*, to reach consensus at the international level on regulating the circulation of knowledge within the framework of the global information infrastructure. UNESCO will also continue to promote the ratification or acceptance by the States of the Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite,[2] adopted at Brussels in 1974.

185. As follow-up to the joint ITU/UNESCO study entitled "The right to communicate at what price?", published in 1995, a pilot project on access to telematics facilities is being implemented in the Caribbean by UNESCO, ITU, the Caribbean Telecommunications Union, the International Council for Scientific and Technical Information and the Pan American Health Organization (PAHO). Two symposia on telematics for development, similar to the one organized in Ethiopia in April 1995 by ECA, UNESCO, ITU and the International Development Research Centre, are to be held in 1997 in Latin America and the Caribbean, as well as in the Arab States. The aim of the above-mentioned activities is to promote collaboration among service providers, telecommunications operators and end-users, particularly in sectors of public concern, in order to improve access to telematics facilities.

186. ICAO is continuing to consider the legal aspects of the implementation of CNS/ATM systems, which principally relate to the legal framework for the Global Navigation Satellite System (GNSS). The task is entrusted to the Panel of Legal and Technical Experts on the Establishment of a Legal Framework with regard to GNSS, established by the ICAO Council in December 1995 upon the recommendation of the Legal Committee, as endorsed by the thirty-first session of the ICAO Assembly.

187. Two working groups were established by the ICAO Panel of Legal and Technical Experts in November 1996. One is to develop provisions of a charter formulating the fundamental principles applicable to GNSS. The other is to consider matters related to certification, liability, administration, financing and cost recovery, and future operating structures. The Panel will meet again in the fourth quarter of 1997.

6. Land, maritime and aeronautical mobile satellite services

188. ITU is developing a series of standards for the International Mobile Telecommunication System IMT-2000, also known as the Future Public Land Mobile Telecommunication System, which is aimed at providing satellite and terrestrial mobile telecommunication anywhere and at any time.

189. IMO is continuing its studies on a worldwide radio-navigation system and has adopted a revised policy for recognition and acceptance of such systems (IMO resolution A.815(19)). GPS and GLONASS, which had been offered by Governments as operational candidate systems, were evaluated, recognized and accepted in 1996. Amendments to the 1974 International Convention for the Safety of Life at Sea are being developed taking into account the above-mentioned policy.

190. As the operational availability of GPS has been guaranteed by the United States only until 2005 and the operational availability of GLONASS has been guaranteed by the Russian Federation only until 2010, IMO is considering the need and seeking the means to develop plans for a post-GPS/GLONASS system, internationally controlled civil GNSS in cooperation with ICAO and other user organizations. A maritime policy for a future civil and internationally controlled GNSS has been approved and is expected to be adopted in November 1997.

191. ICAO, recognizing the limitations of the present air navigation systems and the need to meet future requirements, has taken steps to promote the introduction of, *inter alia*, satellite-based technologies for communication, navigation and surveillance elements in support of global air traffic management. The ICAO CNS/ATM systems are an integration of terrestrial and space elements that will fulfil future requirements. A fundamental prerequisite for the implementation of the systems on a global basis includes the development of uniform Standards and Recommended Practices (SARPs). Several panels of experts are involved in these activities under the responsibility of the ICAO Air Navigation Commission. With respect to space-related elements of the CNS/ATM systems, SARPs and guidance material have been completed or are expected to be completed in the near term for the aeronautical mobile-satellite service, GNSS, the automatic dependent surveillance and the World Geodetic System 1984.

192. The planning and implementation of the CNS/ATM systems of ICAO are facilitated by a global plan and regional planning and implementation groups. A worldwide CNS/ATM systems implementation conference is planned for 1998.

193. ICAO and IMO are continuing cooperation for the multi-modal use of GNSS in order to ensure that the service provided by the system will meet the needs of maritime users as well as the aviation community.

C. Meteorology and hydrology

1. Education and training programmes

Training courses, workshops and seminars

194. In November 1997, ESCAP plans to hold at Beijing, with support from the Government of China for the technical cooperation among developing countries, a training workshop on meteorological satellite applications for sustainable development for 25 participants from the ESCAP region.

195. IOC of UNESCO will continue to organize regional training courses on the applications of remote sensing data to marine studies using the Windows version of the BILKO image-processing software produced in the framework of the Training and Education in Marine Science (TREDMAR) programme.

196. WMO plans to continue to collaborate with the United Nations, other organizations and WMO members in the co-sponsorship of training events during the biennium 1997-1998. The WMO proposals for satellite-related events for the biennium include the eighth training course on tropical meteorology and tropical cyclone forecasting, to be held in 1998, and the third southern hemisphere training course on tropical cyclones, to be held in 1998. The programme of the postgraduate course in hydrology held annually in Kenya contains training in the use of satellite-based images and GIS in hydrology and water resource assessment. In the projects funded by the World Bank in the Mediterranean Sea Basin, called MED-HYCOS, staff from 21 countries will continue to be trained in the operation and management of data collection platforms (DCPs) using Meteosat for collecting hydrological, water-quality and related meteorological data. A similar project, called SADC-HYCOS, will be launched in 1997 for the SADC area.

Fellowships

197. IOC provides annual grants to scientists from developing countries, through the Training, Education and Mutual Assistance Programme, to enable them to participate in short-term training courses in remote sensing on marine-related issues.

198. WMO grants fellowships under its Voluntary Cooperation Programme and its regular budget, as well as through UNDP and trust funds, for studies or training in meteorology, climatology and operational hydrology, including studies and training in satellite meteorology, interpretation of meteorological satellite photographs, satellite transmission systems and nephanalysis. In addition to fellows being trained at the WMO regional meteorological training centres, WMO members also provide training in numerical weather prediction products and interpretation of meteorological satellite data through fellowships offered by them under the Voluntary Cooperation Programme.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

199. UNEP, through GRID-Arendal, continues to maintain a coastal environmental information system for the International Northern Sea Route Programme. The data obtained through the system allow scientists and decision makers to evaluate the operational and accidental transit impact on the coastal environment. The Programme links key institutions in Japan, Norway and the Russian Federation in sponsoring research to develop the knowledge base to evaluate the utility of the remote trade route. GRID-Arendal also assists in the development of the coastal environmental information modelling system.

200. UNEP, through GRID-Arendal, is continuing to refine the GIS database of the Baltic Sea catchment area. The focus of the management of the hydrogeological regions has shifted from the sea itself to the surrounding land as a means of improving the environmental status of the seas. The above-mentioned GIS database can be accessed through the World Wide Web site of GRID-Arendal.

201. FAO is assisting in developing a Nile forecasting centre within the Ministry of Public Works and Water Resources at Cairo to monitor and forecast the flows of the Nile and its tributaries. The project is being carried out with the National Weather Service of NOAA of the United States as a subcontractor for the development of hydrological models.

202. FAO, through its regional remote sensing project in the SADC area, assists SADC in establishing its own facility for reception and processing of Meteosat data, which is expected to become operational durin, 1997.

203. The FAO Fisheries Department plans to install a satellite ground receiving station for NOAA-AVHRR local area coverage image data. The station will be used for satellite limnology, in support of the FAO/FINNIDA project entitled "Research for the management of fisheries on Lake Tanganyika".

Study, pilot projects and operational applications

204. FAO will continue to host the secretariat for the Global Terrestrial Observing System (GTOS), which it established at its headquarters in 1996 on behalf of UNEP, UNESCO, WMO and ICSU. The secretariat was the outcome of the work of the Scientific and Technical Planning Group for GTOS, which had been instituted by the five co-sponsoring agencies in 1993. GTOS is designed to improve the quality and use of terrestrial

ecosystem data and information on a global scale. Its primary objective is to provide policy makers, resource managers and the research community with data needed to detect, quantify, locate and give early warning of changes in the global capacity of terrestrial ecosystems to support sustainable development and improvement of human welfare. The initial implementation plan of GTOS will be finished in 1997. The implementation of GTOS is closely linked with that of the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS), which are co-sponsored by UNEP, UNESCO, WMO and ICSU.

205. UNEP will continue to participate in the programmes of the GCOS secretariat as appropriate and necessary. UNEP will continue to cooperate in the implementation of GOOS and, with FAO, UNESCO, WMO and ICSU, in the further development of GTOS (see paragraphs 204 above and 222 and 223 below).

206. UNEP, through, among others, GRID-Nairobi, completed the first phase of the development of a marine and coastal zone database and atlas for the coast of Kenya, which is supported by the Government of Belgium. A next phase, to extend this initiative to the coastal areas of other continental member States of the East African Regional Sea Action Plan, is under consideration. The work continues to be based on the interpretation of satellite images, mainly Land Remote Sensing Satellite (LANDSAT) thematic mapper data, to map the present status of land cover and features.

207. The Fishery Department of FAO conducts remote sensing activities for fisheries. Satellite remote sensing, in particular when combined with GIS, is increasingly being used in marine and inland fishery projects. FAO is developing GIS for the world ocean fisheries, resources and environment in 1997. Pilot projects on the use of AVHRR data for inland fisheries are in progress.

208. IOC, through GOOS, recently formed the International Ocean Color Coordination Group, which will foster expertise in using ocean colour data by providing training opportunities, express the voice of the user community, stress the importance of ocean colour data to the global community, optimize the quality of data for calibration and validation, advocate the collection of essential ocean and atmosphere data, facilitate merging of data and facilitate access to the data.

209. UNESCO will continue to cooperate with UNEP, FAO, WMO and the International Geosphere-Biosphere (Global Change) Programme of ICSU, in the development of GTOS, which will cover the broad question of monitoring biodiversity. Two activities within the UNESCO MAB programme are of special relevance: the International Network of Biosphere Reserve and the Diversitas Programme.

210. UNESCO and FAO will develop in 1997 a GIS-based tool for the assessment of water resources on a continental scale.

211. IOC, in cooperation with GRID-Arendal and GRID-Nairobi of UNEP, will continue to develop marine data information systems.

212. The application of satellite technology in meteorology, climatology and operational hydrology forms an important element of the technical cooperation activities of WMO. Those activities are generally undertaken with assistance from either the voluntary cooperation programme of WMO or other sources of funding such as UNDP, the World Bank and the European Community. The following activities are planned for 1997 and future years:

(a) *Africa*: A number of WMO members, including France, Germany, Italy, United Kingdom and United States, are donating DCPs to countries in Africa for the collection of meteorological data via the geostationary meteorological satellite Meteosat as well as Meteorological Data Distribution reception stations to improve the availability of observational data and processed information at national meteorological centres. Furthermore,

eight satellite stations of the International Mobile Satellite Organization (Inmarsat) are to be installed in the countries that are members of the Permanent Inter-State Committee for Drought Control in the Sahel with funding from USAID, in order to enhance the flow of data and products between the Agrometeorology and Operational Hydrology and Their Applications (AGRHYMET) regional centre at Niamey and national AGRHYMET centres. Some key stations in the Zambezi river basin will be equipped with DCPs using the Meteosat system for collecting data. A multi-donor project is now under preparation to monitor desert locusts in Africa. Under the project, 50 automatic stations will be installed. In the Niger river basin, 64 DCPs using the Argos system have been operational for a number of years, and plans are being made to install more modern equipment. In collaboration with the World Bank, WMO has drawn up plans to set up in Africa an advanced hydrological and environmental monitoring system using Meteosat. More than 100 DCPs will be installed on major rivers, costing between US$ 10 million and US$ 20 million over a period of five years. For one such regional project for southern Africa, SADC-HYCOS, funding by the European Community will serve to start installing 50 DCPs in 1997;

(b) *Americas*: A new regional meteorological telecommunication network based on two-way multipoint telecommunication services has been operational since the second half of 1995, involving more than 20 countries. The ground equipment was implemented as part of a FINNIDA project for the Central American countries and through other international cooperation funding, mainly from the United States, for the Caribbean countries. The new network dramatically improves the meteorological telecommunication system in the region, including support for the forecast and warning of hurricanes and other severe storms. In addition, the States of the Caribbean region have signed a letter of intent to establish CARIB-HYCOS, a regional component of the World Hydrological Cycle Observing System (WHYCOS) programmes (see paragraph 221 below;

(c) *Europe and newly independent States*: Some European countries such as Albania, Romania and Turkey have expressed a desire to establish and/or upgrade meteorological satellite receiving systems. The newly independent States and other new WMO members are planning to acquire satellite receiving stations to actively monitor the meteorological conditions. Installation of small satellite Earth stations in meteorological services will be pursued and strengthened, in particular for newly independent States, for the reception of meteorological information distributed by RETIM of France and FAX-E of Germany within the framework of regional meteorological telecommunications. MED-HYCOS, a project funded by the World Bank, is currently installing 30 hydrological DCPs in the Mediterranean area.

213. Within the framework of the WMO plan of action for the International Decade for Natural Disaster Reduction, a special project to upgrade the tropical cyclone warning system for the south-west Indian Ocean subregion has been established with financial assistance from the European Development Fund. The project is based on the application of meteorological satellite and microcomputer technology and on the transfer of scientific knowledge. The project will be continued in 1997.

214. The overall long-term goals of the World Climate Research Programme (WCRP), jointly sponsored by WMO, ICSU and IOC, are to determine to what extent climate can be predicted and the extent of human influence on climate. Progress in this scientific programme depends on the successful continuation or new development of space-based Earth observing systems. Key elements of WCRP with respect to the use of satellite data are as follows:

(a) The scientific plan for WCRP gives high priority to understanding the effects of cloudiness on the radiation and energy budget. The International Satellite Cloud Climatology Project is producing long-term climatological records of global cloud amount and properties, as well as radiation flux data from the international array of geostationary meteorological satellites and operational polar-orbiting satellites. The project has been extended to the year 2000;

(b) Several major observational programmes are pursued by WCRP: World Ocean Circulation Experiment (WOCE), the Global Energy and Water Cycle Experiment (GEWEX) and the Arctic Climate System Study (ACSYS). The new Topex/Poseidon satellite for ocean surface topography, jointly developed and operated by NASA and CNES, and the ESA satellite ERS-2 are of particular importance for WOCE and ACSYS;

(c) Within GEWEX, WCRP produces global monthly fields of precipitation and daily water vapour column content maps based on a combination of ground-based measurements and remote sensing data from multiple satellite sources;

(d) Within GEWEX, WCRP has stimulated studies on a rain and cloud radar satellite mission in order to get divergences of energy fluxes in the atmosphere.

215. WMO continues to cooperate closely with UNEP, IOC and ICSU in the development of GOOS and to provide support for GOOS planning and implementation.

216. Climate system monitoring activities within the World Climate Data and Monitoring Programme make use of satellite data for monitoring such parameters as sea level, atmospheric temperature, sea ice, snow cover, solar radiation, aerosol optical depth, albedo and clouds. The WMO World Climate Data Information Referral System (INFOCLIMA) includes information on some available satellite data sets needed for climate monitoring and research. A Climate Change Detection Project has been established under the World Climate Data and Monitoring Programme to advise on the suitability of data, including satellite data, for detecting climate change. The World Climate Applications and Services Programme continues to investigate and promote development of potential uses of satellite data in climate applications, especially within the framework of the Climate Information and Services project.

217. WMO continues to provide valuable data and assessments concerning atmospheric status through Global Atmosphere Watch (GAW), which it established in 1989 as a long-term monitoring and research system to detect changes in the greenhouse gases, including ozone, aerosols and other trace substances in the atmosphere that may lead to global climate change. GAW data include surface and vertical observations which provide information required to verify satellite-based measurements of selected atmospheric constituents. In particular, GAW, through its more than 150 total ozone monitoring stations, has furnished critical ground truth data to calibrate ozone observations from space. These satellite observations, in turn, provide vital information used in the preparation of near-real-time ozone bulletins on the state of the ozone layer both during the Antarctic Austral spring and the northern hemisphere winter.

218. The WMO Commission for Atmospheric Sciences continues to rely on the use of satellite data for research, for both climate studies and weather analysis and prediction of all time scales. The WMO programmes on weather prediction and tropical meteorology research will study the application of high-resolution quantitative satellite data.

219. Major WMO global data-processing centres operated by WMO members and equipped with supercomputers and high end mainframe computing facilities depend on remotely sensed data from meteorological satellites for operational input data, particularly in ocean and land areas for which data are otherwise sparse. Data acquired by meteorological satellites are used in global atmospheric and ocean models for numerical weather prediction and environmental quality assessment, as well as climate monitoring and medium-range, long-range, seasonal and multi-seasonal weather and climate prediction.

220. Based on the structure of the WMO Hydrology and Water Resources Programme, a number of projects relating to hydrological networks and instrumentation, hydrological forecasting methods and systems and the

application of remote sensing techniques to operational hydrology are undertaken on a continuing basis. The programme is revised every four years by the WMO Commission for Hydrology. The results of the projects formulated by the Commission at its tenth session in 1996 will be available in the year 2000.

221. WMO and the World Bank are promoting a major long-term initiative to improve knowledge of the hydrological cycle through WHYCOS. WHYCOS would consist initially of about 1,000 stations worldwide on major rivers. Each station would monitor about 15 variables such as flow, suspended load, water chemistry and on-bank meteorological variables. Many of the stations already exist, mostly in developed countries. The data collected would be transmitted via geostationary satellites to national, regional and global centres, employing, among others, the WMO World Weather Watch system where applicable. In turn, WHYCOS should contribute data to the World Weather Watch system, GCOS and GTOS. The concept has taken a practical shape in the Aral Sea basin, Latin America and the Caribbean and in southern Africa.

222. WMO continues to make joint efforts with UNEP, IOC and ICSU in implementing various programmes in 1997 and future years under GCOS, which was established by those organizations to conduct observations that would meet scientific requirements for monitoring the climate and predicting climate changes. The Joint Scientific and Technical Committee and the Joint Planning Office were also established to develop the plans and strategy for the implementation of GCOS. The programmes of GCOS will be implemented in accordance with the initial plan developed by the Joint Scientific and Technical Committee, which outlined the scientific priorities for the programme and proposed a strategy for proceeding, including defining the components of an initial operational system.

223. A space component is considered a key element of the initial operational system. The Joint Scientific and Technical Committee formed a Space-based Observation Panel, which developed and issued in June 1995 a GCOS Space Plan, the initial plan for the space-based observation component. In 1996, the Space Observation Panel was asked to broaden its focus by including GTOS and GOOS space requirements and has been renamed as Global Observing Systems Space Panel. The GCOS Space Plan is aimed at the following: (a) defining the components of the initial operational system, based on the existing systems of various space agencies; (b) outlining the scientific and technical requirements for observations of global, atmospheric, oceanic and terrestrial climate variables that may be made with space instrumentation; and (c) reviewing existing and planned space agency missions for compliance with GCOS requirements, including assured continuity of the observations. A reviewed and updated Space Plan will be available in the middle of 1997. Copies of the initial plan for GCOS are available from the Joint Planning Office of GCOS at Geneva or via Internet at the GCOS home page (htpp://www.wmo.ch/web/gcoshome.html). The joint Scientific and Technical Committee also issued the Data and Information Management Plan, which outlines strategies for an international data distribution system to be implemented in the period 1996-1998.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

Dissemination of technological information

224. UNEP, through DEIA/GRID-Bangkok, continues to work on the following collaborative undertakings:

(a) Coastal and Marine Environmental Management Information System for the South China Sea area, covering Cambodia, southern China and Viet Nam; phase 2 of the project is being initiated in 1997 with continued support by the Government of Sweden and the Asian Development Bank;

(b) Further development of the North West Pacific Action Plan of the UNEP Regional Seas Programme.

225. In the biennium 1997-1998, ESCAP will prepare, publish and disseminate, as part of its regular information service activities, a series of posters on meteorological satellite applications.

226. UNESCO, in collaboration with ITC, will publish in 1997 and distribute free of charge the Arabic translation of the book entitled *Introduction to the Use of GIS in Practical Hydrology*.

227. UNESCO, within the framework of the International Hydrological Programme and in collaboration with the International Association of Hydrological Sciences, will organize the next international conference on GIS entitled "Application of Hydrology and Water Resources Management", at Vienna in 1998.

228. WMO issues a biennial report on the status of implementation of the World Weather Watch. The report includes a section on the space-based portion of the Global Observing System, consisting of a network of geostationary and polar-orbiting satellites. The next report will be published in mid-1997. The status of satellite technology for application in meteorological observations and telecommunications is considered at each session of the WMO Commission for Basic Systems, which meets on a biennial basis. The next session of the Commission will take place during the second half of 1998.

229. WMO, in cooperation with IOC, continues to make considerable efforts to develop shipboard facilities that will enable ships at sea to receive meteorological and oceanographic data from Inmarsat and will disseminate warnings and forecasts.

230. The WMO Commission for Marine Meteorology, the joint IOC/WMO Committee for Integrated Global Ocean Services System and the IOC Committee for the International Oceanographic Data and Information Exchange maintain a high level of interest in the use of satellites for both ocean observation and marine communications. A group of experts from the above-mentioned bodies has prepared a consolidated report on polar-orbiting oceanographic satellites and will expand its report in 1997 and beyond to cover geostationary satellites, the management of ocean satellite data and other remote sensing issues.

231. A working group of the WMO Commission for Agricultural Meteorology is currently responsible for reviewing and summarizing the development of techniques and methods to obtain and manage ground-based and remotely sensed agrometeorological and agronomic data in the most timely and efficient manner for application to agriculture. A report concerning processing and analysis of remote sensing data as well as the application of those data to agriculture has been issued.

232. The WMO Commission for Aeronautical Meteorology is actively involved in the development and implementation of the ICAO World Area Forecast System (WAFS), which uses satellite-based communication systems to distribute information on aeronautical meteorological forecasts in support of aviation. The United Kingdom transmits WAFS products to cover Africa, Europe and west Asia, and the United States transmission covers the rest of the world.

Elaboration of strategies or plans for future applications programmes or systems and/or policy coordination

233. The GCOS secretariat, jointly established by UNEP, WMO, IOC and ICSU, reports frequently on the Joint Scientific and Technical Committee, experts and panel meetings. Revised and updated space observation and terrestrial observation plans, including recommendations and the list of user requirements, are available from the Joint Planning Office secretariat. Newsletters to initiate and foster the exchange of ideas and information are provided by the secretariat on a regular basis and are available, together with all other publications, via the net link (http://www.wmo.ch/web/gcos/gcoshome.html).

234. UNEP, FAO, UNESCO, WMO and ICSU cooperate in the Sponsors Group for the Global Observing Systems (GCOS, GOOS and GTOS) with the objective of providing advice and making recommendations to the sponsoring organizations and their governing bodies, the Observing System steering committees, secretariats and expert panels, as well as possibly other groups, including funding bodies and Governments. In this context, FAO particularly contributes to the activities of the joint Panel on Space-based Observations.

235. ESCAP plans to hold, with both bilateral and multilateral funding support from donors, a meeting of the Regional Working Group on Meteorological Satellite Applications and Natural Hazards Monitoring in March 1998.

236. ESCAP will prepare in 1997 a roster on meteorological satellite applications for sustainable development in the region. The product will be available in both analogue and CD-ROM forms.

D. Basic space science

237. The United Nations Programme on Space Applications is planning to hold the Seventh United Nations/ESA Workshop on Basic Space Science: Small Astronomical Telescopes and Satellites in Education and Research, which is being organized in cooperation with the Government of Honduras, at Tegucigalpa from 16 to 20 June 1997.

238. In 1997 and beyond, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will continue its collaboration with ESA in carrying out follow-up activities relating to the series of workshops on basic space science organized in the period 1991-1997.

E. Safety aspects and natural disaster reduction

239. In accordance with General Assembly resolution 49/22 B, and within the International Framework of Action for the International Decade for Natural Disaster Reduction, the IDNDR secretariat will organize an international conference on early warning systems for the reduction of natural disasters, to be held at Potsdam, Germany, from 7 to 11 September 1998. The conference, which is one of the preparatory events leading to the closing of the Decade, will consider the latest scientific and technical achievements in natural disaster reduction and in the modelling of disaster scenarios, techniques and methods for disaster detection and prediction, including the important role of satellites, as well as the decision to formulate warning and disseminate data via communications systems.

240. BDT of ITU has a programme from 1994 to 1999 to elaborate, with the participation of IMO, Inmarsat and ITU members, master plans for the development of maritime radiocommunication services, including the implementation of GMDSS.

241. ITU Radiocommunication Study Group 8 (mobile, radio determination, amateur and related satellite services) continues to examine various aspects of satellite uses in GMDSS, including the characteristics of satellite emergency position-indicating radiobeacon (EPIRB) systems, and studies on technical and operational characteristics of satellite systems participating in GMDSS.

242. IMO, in close cooperation with the Radiocommunication Bureau of ITU and the International Hydrographic Bureau of the International Hydrographic Organization, has finalized a study on the use of electronic chart display and information systems on board ships, including means of updating electronic navigational charts, which will be broadcast through the Inmarsat Enhanced Group Call and SafetyNET systems. Operational performance standards for the Electronic Chart Display and Information System have been approved and are being implemented.

243. The amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS) that were adopted by the 1988 Conference of Contracting Governments entered into force on 1 February 1992, introducing GMDSS. The system is being introduced in stages and will be fully implemented on 1 February 1999. Satellite communications form a major part of GMDSS, and all SOLAS ships are requested to carry a satellite EPIRB. IMO also continues to prepare the Master Plan of shore-based facilities for GMDSS and provides technical assistance on this matter to developing countries.

244. The further development of GMDSS to provide for its orderly introduction will be continued by IMO in close cooperation with ITU, WMO, the International Hydrographic Organization, Inmarsat and the International Search and Rescue Satellite System (COSPAS-SARSAT).

245. IAEA will assist in the reviewing of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, adopted by the General Assembly in its resolution 47/68 of 14 December 1992. The Principles were prepared based on the recommendations of the International Commission on Radiological Protection (ICRP), which have been revised since 1992. The most recent ICRP recommendations on radiation safety are incorporated in the IAEA International Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, which have been approved by the International Labour Organization, FAO, WHO, IAEA, PAHO and the Nuclear Energy Agency of OECD. The International Basic Standards have been published by IAEA as Safety Series No. 115. Therefore, IAEA has indicated in sessions of the Committee on the Peaceful Uses of Outer Space that there is an urgent need to revise the Principles, as they are technically wrong, and they should be made consistent with the IAEA Basic Safety Standards.

246. IAEA will place high priority on the revision of the safety principles in the United Nations treaties and principles on outer space, in particular those relating to the notification of re-entry of space objects with nuclear power sources on board and the subsequent assistance to States, since they conflict with two IAEA conventions: the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Under the Notification Convention, States parties have the obligation to immediately notify IAEA in the event of any radiological accident, including those involving the use of radioisotopes or nuclear reactors for power generation in space objects. Under the Assistance Convention, upon receiving a request for assistance from a State party or member States, IAEA is required to coordinate assistance at the international level. Therefore, IAEA considers it important to be promptly notified of any re-entry of radioactive materials to Earth and to be kept updated with information. IAEA will continue to offer its technical expertise to and cooperate with the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space and its Working Group on the Use of Nuclear Power Sources in the eventual review of the safety principles in order to ensure their adherence to current international principles on radiation protection and nuclear safety and, if necessary, will assist the Office for Outer Space Affairs in preparing draft revisions of the United Nations treaties and principles on outer space.

247. At its thirty-fourth session, in 1997, the Scientific and Technical Subcommittee agreed that technical experts, including experts from IAEA, should be invited to the fifteenth session of the Working Group on the Use of Nuclear Power Sources, in 1998, to study the current international technical standards on the use of nuclear power sources in outer space.

F. Other activities in the field of space science

1. Establishment of centres for space science and technology education

248. In response to General Assembly resolutions 45/72 and 50/27, the United Nations Programme on Space Applications continues to make progress in establishing regional centres for space science and technology education in developing countries. The centres are expected to enhance the academic and professional

capabilities and technical infrastructure in space science and technology in each region. The following activities will be conducted in 1997 and beyond:

(a) The Programme will continue to provide technical advisory assistance to the regional Centre for Space Science and Technology Education in Asia and the Pacific, which was inaugurated in India in November 1995 and will start the third nine-month education programme on the use of space technology in October 1997, in developing and organizing educational and training programmes in various fields of space applications;

(b) The Programme will provide technical advisory assistance to the Governments of Brazil and Mexico, which recently announced that they had signed on 11 March 1997 the agreement establishing the regional Centre for Space Science and Technology Education in Latin America and the Caribbean, and will coordinate educational and training activities with the Centre;

(c) The Programme is providing assistance to the Governments of Morocco and Nigeria for the establishment of centres for French-speaking and English-speaking countries in Africa, respectively; those centres are expected to become operational in the second half of 1997;

(d) The Programme will provide assistance, as necessary, to the international initiatives to establish a regional centre in western Asia, which currently involve Jordan, Saudi Arabia and the Syrian Arab Republic;

(e) The Programme continues to provide technical assistance in support of the international initiatives to establish a network of space science and technology education and research institutions for central and south-eastern European countries, which involve Bulgaria, Greece, Poland, Romania, Slovakia and Turkey; in this connection, the Programme will undertake a study on the technical requirements, design, operation mechanism and funding of the network.

249. ECA will continue to support the initiative of the Office for Outer Space Affairs to establish regional centres for space science and technology education in Africa as a necessary step for the creation of endogenous technical capacity and as a complement to the training normally offered by regional centres.

2. Other activities

250. The General Assembly, in its resolution 51/123 of 13 December 1996, endorsed the recommendation of the Committee on the Peaceful Uses of Outer Space that a special session of the Committee (UNISPACE III), open to all States Members of the United Nations, should be convened at the United Nations Office at Vienna, preferably in 1999. In the same resolution, the Assembly requested the Committee and its Scientific and Technical Subcommittee to act as the Preparatory Committee and the Advisory Committee for UNISPACE III. The Assembly also requested the Office for Outer Space Affairs to act as the executive secretariat. At its 1997 session, held from 17 to 27 February, the Advisory Committee prepared a detailed agenda for the UNISPACE III Conference and recommended that the UNISPACE III Conference should be held in July 1999. The recommendations on matters relating to the UNISPACE III Conference concerning the objectives, form, venue, date, participants, provisional annotated agenda, financial aspects and additional components of the Conference are contained in the report of the Scientific and Technical Subcommittee (A/AC.105/672, annex II, paragraphs 18-23).

251. As part of the preparatory work for the UNISPACE III Conference, the Office for Outer Space Affairs will organize regional conferences and meetings (see paragraph 252 below) and coordinate other regional preparatory activities as necessary. In order to facilitate deliberations at the UNISPACE III Conference that may

lead to the preparation of a plan of action, the Office for Outer Space Affairs will prepare the following background papers to be issued in 1998:

(a) *Earth and its environment in space*: a paper reviewing the status of scientific knowledge of Earth and its environment, the state of knowledge on meteorology and seasonal-to-annual climate prediction and its impact on agriculture, forestry, fisheries and disaster management;

(b) *Disaster prediction, warning and mitigation*: a paper examining the role of space technology in (i) disaster preparedness, warning and mitigation; (ii) environmental hazard detection and mitigation; (iii) global health; and (iv) emergency communications;

(c) *Management of Earth resources*: a paper examining the Earth observation systems for (i) coastal degradation and management; (ii) freshwater management (iii) agricultural planning; and (iv) management of natural resources;

(d) *Satellite navigation and location systems*: a paper reviewing navigation and precise location systems and their applications;

(e) *Space communications and applications*: a paper covering issues relating to satellite communication and broadcasting systems, mobile satellite communications, applications in tele-education, including rural education, telemedicine, family welfare, emergency communications, and transnational satellite direct broadcasting;

(f) *Basic space science and its benefits*: a paper examining the status of knowledge on the structure and evolution of the Universe, the solar system and life on Earth, perspectives of ground-based and spaceborne astronomy relating to the impact of space activities on astronomy and the cultural, social and educational aspects of astronomy;

(g) *Commercial aspects of space exploration including spin-off benefits*: a paper reviewing the development of space-related commercial markets, technology transfer and spin-off benefits, economic and social impacts of space commercialization and international cooperation;

(h) *Information systems for research and applications*: a paper discussing research information and capabilities addressing critical issues such as global change, desertification, biodiversity and deforestation and the need for a global approach to research that is cognizant of the needs of and contributions by developing countries;

(i) *Small satellite missions*: a paper examining the philosophy of microsatellites and small satellites, complementarity of large and small satellite missions and a scope of small satellite applications, as well as discussing the low-cost launchings of small satellites and the necessary ground support for small satellites, economic and legal aspects of small satellite projects, the role of educational and research institutions and the commercial sector, in addition to regional and international cooperation;

(j) *Education and training in space science and technology*: a paper examining the philosophy of education and training and how it is, and should be, reflected in the space education programmes at the global level and also reviewing various ongoing and planned space-related education programmes and activities.

252. The United Nations Programme on Space Applications is planning the following activities in the period 1997-1998:

(a) Second United Nations/United States of America International Conference on Spin-off Benefits of Space Technology: Challenges and Opportunities, to be held in the United States in October or November 1997;

(b) United Nations/European Space Agency Symposium on Space Industry Cooperation with the Developing World, which is being organized with the Government of Austria, the province of Styria, the city of Graz and ESA from 8 to 11 September 1997;

(c) United Nations/International Astronautical Federation Workshop on Space Technology as a Cost-Effective Tool to Improve Infrastructure in Developing Countries, being co-sponsored by ESA and the European Commission and organized in cooperation with the Government of Italy, to be held at Torino, Italy, from 2 to 5 October 1997;

(d) United Nations/European Space Agency Regional Meeting on Space Technology and Applications for Development (with emphasis on microwave remote sensing applications and including preparations for the UNISPACE III Conference) in Asia and the Pacific, to be held in Malaysia in 1998;

(e) United Nations Regional Conference for Decision Makers on Space Technology Development (including preparations for the UNISPACE III Conference), to be held in Africa in 1998;

(f) United Nations Regional Meeting on Space Technology and Applications for Development (with emphasis on information technology and including preparations for the UNISPACE III Conference), to be held in Latin America and the Caribbean in 1998;

(g) United Nations/Austria Symposium on Economic Benefits of Applying Space Systems in Support of Resources Planning, Education and Communication Infrastructure (including preparations for the UNISPACE III Conference), to be held at Graz, Austria, in 1998;

(h) Third United Nations Regional Conference on Spin-Off Benefits of Space Technology, to be held in Asia or the Caribbean in 1998;

(i) United Nations/International Astronautical Federation Workshop on Expanding the User Community of Space Technology in Developing Countries, to be held at Melbourne, Australia;

(j) United Nations Second Seminar on Space Future and Human Security, to be held in the province of Tyrol, Austria, early in 1998.

253. The Office for Outer Space Affairs, in the period 1997-1999, will continue to provide technical advisory assistance to the Government of Uruguay in its follow-up, as *pro tempore* secretariat, of the recommendations of the Third Space Conference of the Americas, held at Punta del Este, Uruguay, in November 1996, in particular the implementation of the plan of action adopted at the Conference.

254. Since 1989, the United Nations Programme on Space Applications has published an annual collection of papers selected from among those presented at the meetings, workshops and training courses organized under its auspices. The publication, entitled *Seminars of the United Nations Programme on Space Applications*, covers different aspects of space science and technology. It includes papers that are broad in scope and of enduring interest. The eighth edition, which contains manuscripts presented at meetings organized in 1996, has already been issued, and the ninth edition will be issued in early 1998.

255. In order to keep the Member States and the general public informed of the latest developments in activities carried out by the United Nations Programme on Space Applications, the home page of the Programme was

established on Internet within the home page of the Office for Outer Space Affairs. The home page, which is accessible through the World Wide Web (http://www.un.or.at/oosa_kiosk/sapidx.html), contains information on activities that have been implemented, as well as reports and press releases issued within the framework of the Programme. The schedules, objectives and programmes of planned activities are also included in the home page.

256. ESCAP will organize the following meetings:

(a) Third meeting of the Regional Working Group on Space Sciences and Technology Applications, to be held in February 1998 in Bali in Indonesia;

(b) Seminar on small satellite development and data applications in Asia and the Pacific, to be held in November 1997 at Phuket, Thailand.

257. ESCAP is conducting a study on the promotion of small satellite data applications in Asia and the Pacific in early 1997. The study is aimed at assessing the status of small satellite technology in Asia and the Pacific and identifying the issues related to the establishment of data reception and processing facilities in the region. Topics covered by the study include payload development and sensors, major applications themes, spacecraft development, launch and data reception capabilities, data characteristics and analysis capabilities, as well as related needs and institutional, technical and financial issues.

258. ESCAP will publish and disseminate, as part of its regular information service activities, a report of the study on the status of small satellite technology in Asia and the Pacific. ESCAP officially launched its home page on 28 April 1997. As a first step, an arrangement was made between ESCAP and United Nations Headquarters to disseminate information on ESCAP through the United Nations Web page. That arrangement is temporary until ESCAP has established its own Internet server. Information on the Regional Space Applications Programme for Sustainable Development can now be found on the World Wide Web (http://www.un.org/dept/escap).

259. In 1997, WIPO, through its International Bureau, will prepare for, convene and service a meeting of consultants to study the desirability and feasibility of adopting rules and/or recommending principles, common to all countries and interested intergovernmental organizations, for the intellectual property protection of inventions and literary and artistic works created or used in outer space. For the years 1998 and 1999, it is expected that the above activity will be continued, pending the approval in September 1997 of the WIPO programme and budget for 1998 and 1999.

260. In accordance with General Assembly resolution 51/123 of 13 December 1996, the Legal Subcommittee considered at its thirty-sixth session, held at Vienna from 1 to 9 April 1997, the question of adding new items to its agenda. As a result, the Legal Subcommittee recommended to the Committee that a new agenda item entitled "Review of the status of the five international treaties governing outer space" should be included in the agenda of the Subcommittee starting with its 1998 session.

261. The Office for Outer Space Affairs will continue to maintain, on behalf of the Secretary-General, the United Nations public register of information furnished in accordance with article IV of the Convention on Registration of Objects Launched into Outer Space (General Assembly resolution 3235 (XXIX), annex) and to disseminate such information to Member States.

262. UNIDO has established five technical centres, which have become fully operational, and five more technical centres are being established. The International Centre for Science and High Technology, which has been established in cooperation with the Government of Italy, has numerous annual work programmes in the

following three priority areas: pure and applied chemistry; Earth, environmental and marine sciences and technologies; and high technology and new materials. The programmes at the Centre include the monitoring of industrial siting and pollution by remote sensing and *in situ* automated instrumentation and utilization of new instruments, including satellites, for environment-friendly processing technologies and for monitoring the environment. The Centre also provides four one-year fellowships and organizes four three-week study tours.

Notes

[1]*Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions Adopted by the Conference*, resolution 1, annex II.

[2]United Nations, *Treaty Series*, vol. 144, No. 17949.